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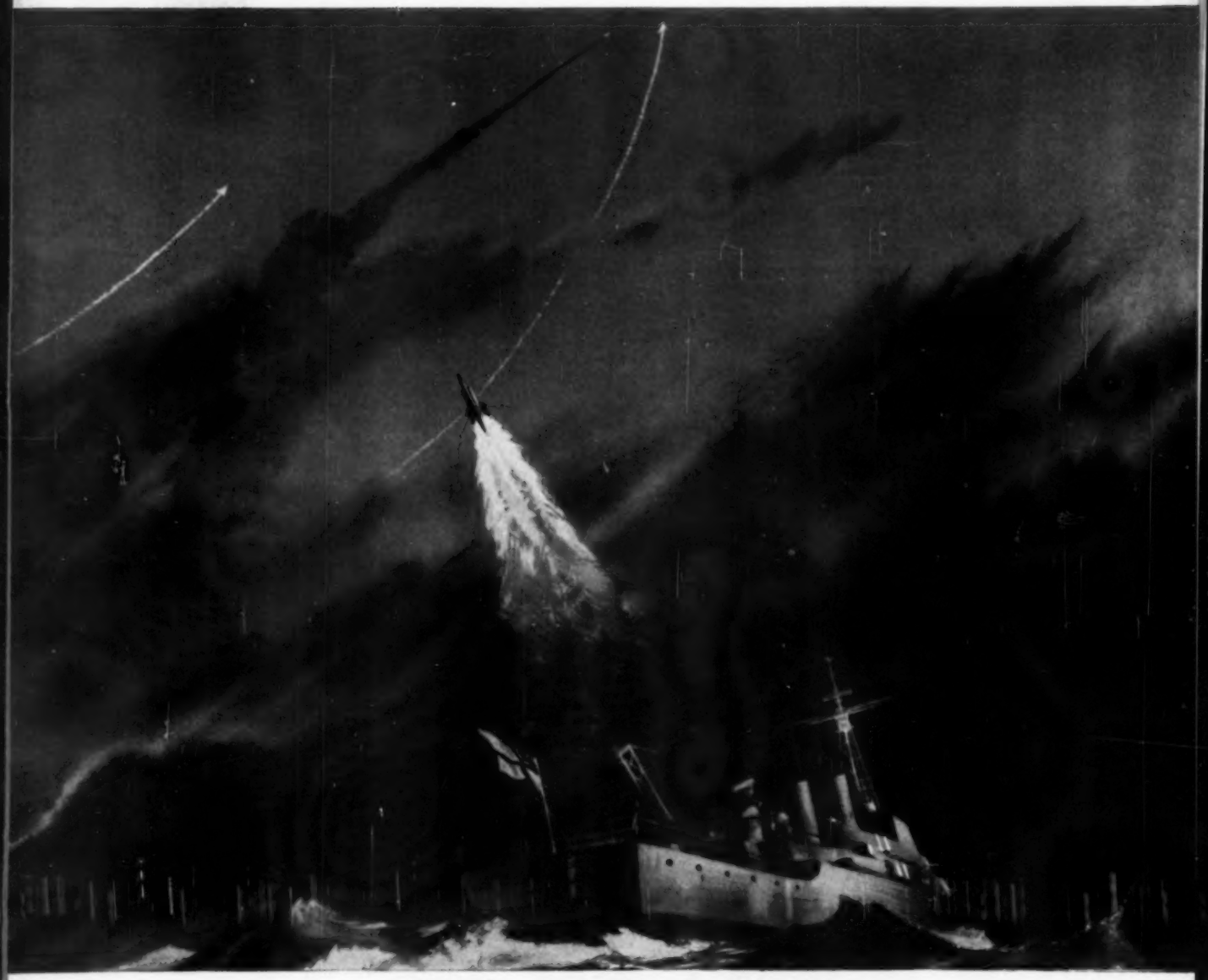

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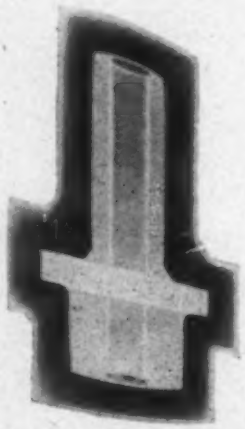

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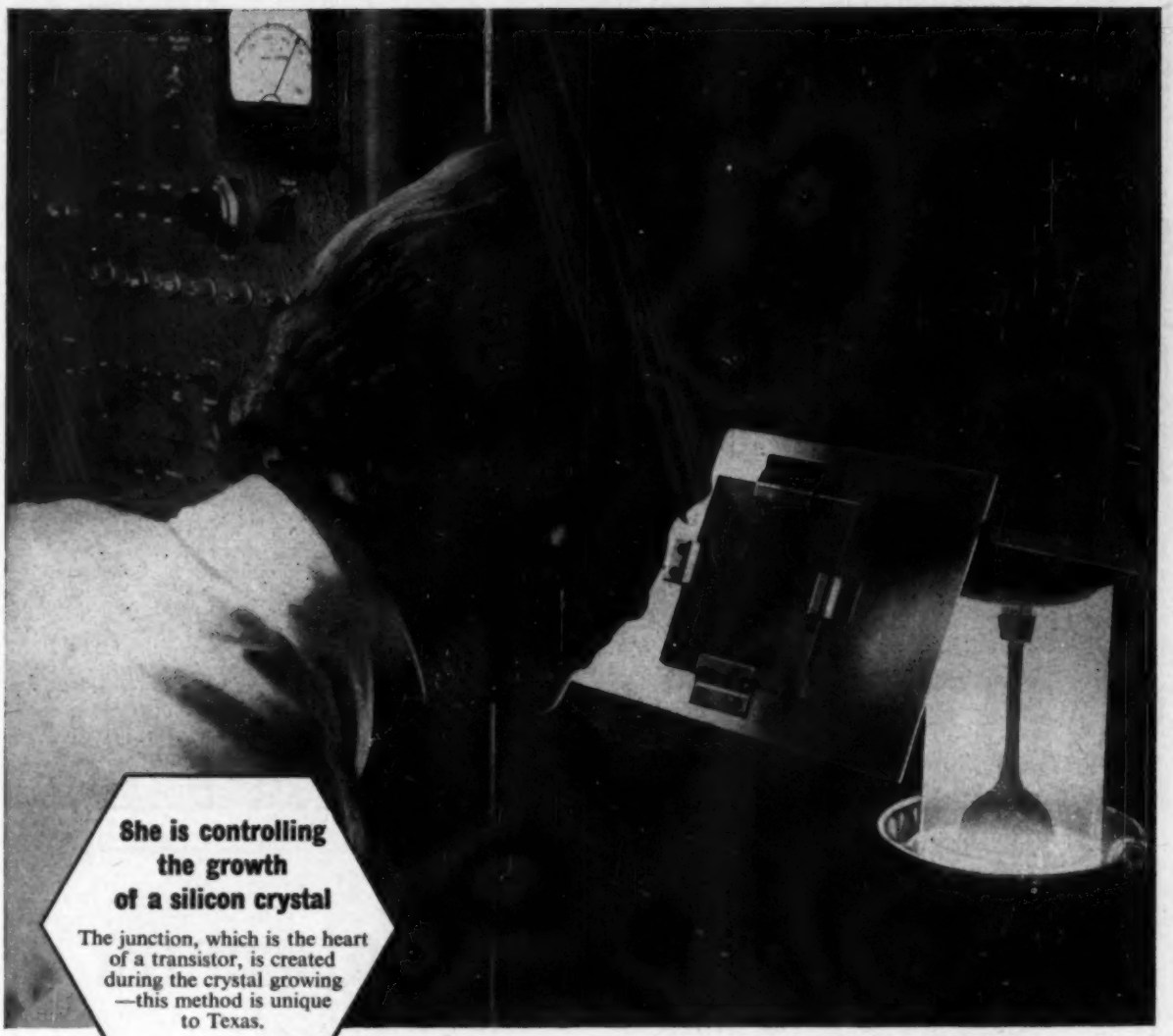

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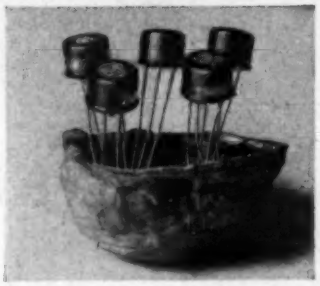

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Fig. 2

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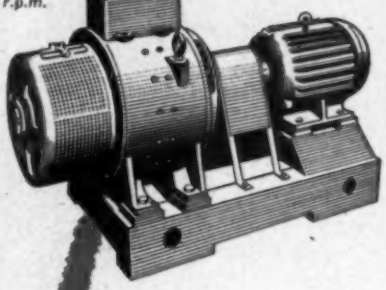

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AIRCRAFT ENGINEER

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Dectra: A Bird in the Hand

AT each successive conference on navigation and traffic control the North Atlantic is usually singled out as a congested area requiring improved facilities. It may seem incredible that this vast ocean airspace should not provide the safest of passages for a mere 160 aircraft at a time; but even the most remote possibility of collision must at all costs be avoided, so traffic has to be controlled to ensure that separation between individual aircraft does not fall below a safe minimum. The navigation aids available, and the radio communications, until recently provided no uniform coverage of the whole area.

Several navigation systems, with multi-million-dollar backing, are being developed in the U.S.A., but as yet the characteristics of these are relatively unknown quantities. There is one British aid, however—Decca's Dectra—which is already covering the whole North Atlantic area from east to west and from Iceland to the Azores; and direct transfer is possible to Decca Navigator chains at each end of the main trunk route. Any doubts about the system are quickly vanishing in face of proven performance. Pan American's report on their trials with a Dectra-equipped Stratocruiser (*Flight*, July 25) emphasized its accuracy and the "new concept in presentation," its simplicity, and its ability to operate in the face of severe precipitation static. B.O.A.C. has told *Flight* that during Comet 2E proving flights to Gander, the new aid allowed accurate track-keeping of a kind which could permit closer lateral separation and greater freedom in choice of cruising height for jet airliners.

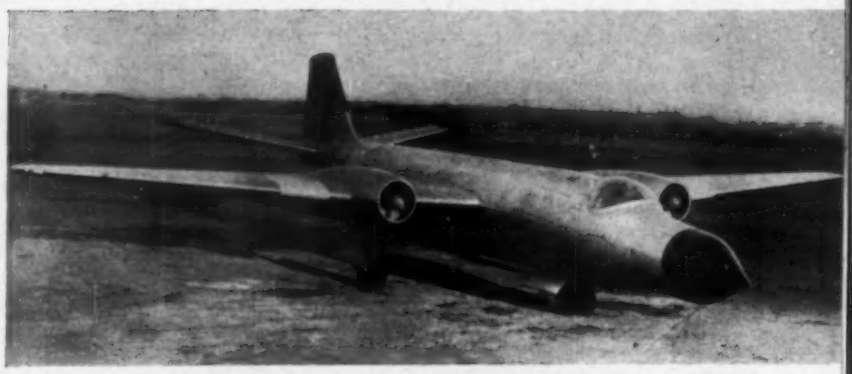
This new all-British system is installed and working. It offers direct correspondence with existing Decca chains on either Atlantic seaboard; it can be combined with Doppler; and it presents information pictorially. It is certainly a bird in the hand, worth many million-dollar birds in the research thicket.

Keeping to Standard

NO time has been lost by the international jury which judged the standard-class gliders at Leszno in drafting a specification for this type of sailplane in the 1960 World Championships. Only a month after the last of the 1958 competitors departed from the Polish plains, the Organisation Scientifique et Technique Internationale du Vol à Voile has issued the jury's findings—which outline obligatory requirements for the type and make five recommendations. This promptitude is all to the good; and although the specification (details of which are given on p. 213) has not yet been adopted by the F.A.I. international gliding committee, OSTIV does not think any major modifications will be made and urges designers and constructors to go ahead for the 1960 standard class.

Leszno was a landmark in the history of World Gliding Championships in that the contest was for the first time divided into open and standard classes instead of, as previously, single-seater and two-seater. This fresh division seems to have proved entirely acceptable; as our representative Kenneth Owen, who was a member of the British team, put it in his final report: "The new standard class has proved a great success in this its first international trial. With closely matched gliders the competition has been, if anything, closer than in the open class . . ."; and again, "The idea of 15-metre practical gliders clearly makes sense . . ."

This stress upon practical types, capable of being operated economically, in the rough-and-tumble of club flying as well as in the more exotic arena of world contests, appears in the jury's recommendation that the glider should be cheap to make, using simple methods of construction, and should be "easily rigged and derigged and simple to transport on a trailer." Such insistence on simplicity, which also appears in the requirement banning a retractable undercarriage, is again all to the good. No one wishes any country to be debarred from putting its utmost engineering ingenuity into the construction of standard-class gliders, but in this amateur sport there obviously should be certain limitations, and the jury which at Leszno watched the first standard-class contest has done its best to define them.



RADAR TRAINER: First picture of the English Electric Canberra T.11, developed for the training of pilots and navigators in the use of airborne interception radar (news item below).

FROM ALL QUARTERS

Canberra A.I. Trainer

DESIGNATED the T.11, a new version of the English Electric Canberra—for R.A.F. Fighter Command, to be used for training pilots and navigators of A.W. fighters in the use of A.I. radar—was announced last week. The T.11 is a modification of the B.2, with A.I. radar mounted in the nose. [A photograph of a B(I).8 with Ferranti Airpass fire-control equipment installed for trials was published in *Flight* for July 4, p. 6]. A crew of four is carried in the T.11 (including the two under training) and design modification has been done by Boulton Paul Aircraft, Ltd., at Wolverhampton.

The T.11 is the third new version of the Canberra to be announced in the last three months. The other two were the U.10, a pilotless target aircraft, announced in May; and the production-type P.R.9, which made its first flight in July.

American's Big Surprise

LAST week, according to reliable reports received as this issue of *Flight* went to press, American Airlines ordered the biggest fleet of jet airliners since Pan American Airways invoked the new jet era in October 1955 with the first orders for Boeing 707s and Douglas DC-8s. In an announcement which must have jolted the whole U.S. domestic airline industry to its foundations American Airlines revealed: (1) An order for 25 Boeing 720s, (2) an order for 25 Convair 880s. Total value is said to be about £48 millions.

The surprising aspect of these big orders—which are additional to American's existing contracts for 25 Boeing 707-120s (now reduced from 30) and 35 Lockheed Electras—is that they have been placed at a time when the U.S. airline industry is making a special point of currying sympathy for its financial difficulties. For many months now the U.S. airlines have clamoured for higher fares with which to pay for the £1,000 millions'-worth of equipment now on order.

American's financing arrangements are not yet known, though the *Financial Times* reports that American have arranged to *lease* the powerplants of 85 aircraft out of their total new turbine fleet of 110 aircraft. This will be accomplished by a manufacturer-financed arrangement involving Pratt and Whitney (Boeing 707 powerplants), General Electric (Convair 880 powerplants), and Allison (Electra powerplants).

A significant result of the order is the healthy position in which the Convair 880 may at last find itself. A total of 88 is now on order; and though this number does not yet represent a break-even production run, Convair must now be viewing the future of their relatively slow-selling medium jet with greater optimism. Domestic carriers which have now bought the Convair 880 include T.W.A., 30; Delta, 10; Capital, 15; American, 25. Boeing, too, must be encouraged to have a second customer for their 720; United Air Lines had previously bought 11.

Pre-Farnborough Boom

RECORD sales by the aircraft industry during the first six months of this year mean that its export trade has now exceeded £700m since the end of the war—an achievement which forms a proud prelude to the 19th S.B.A.C. flying display and exhibition, focal point of the industry's overseas sales drive at Farnborough next month.

The post-war total of £708,956,075 has been attained through sales abroad during the first six months of 1958 amounting to £77,208,814—representing an increase of 46 per cent over the same period last year (£52.9m) and compared with £55.9m and £30.7m for the first half of 1956 and 1955 respectively. Thus the industry is maintaining its record annual rate of £154m, compared with last year's record annual total of £116½m.

The total for the second quarter of 1958 was £40,803,529, the largest quarterly figure ever achieved and £2½m more than the year's first quarterly total. The June figure, £12,623,933 (28 per cent up on June last year), was the sixth largest monthly total ever achieved by the industry. Aircraft and parts accounted for £8,087,371, aero-engines £4,163,338 (the third highest monthly total ever recorded), electrical equipment £203,248, aeronautical instruments £138,379 and tyres £31,597. The leading buyer was India (£2,007,759), followed by Canada (£1,525,865), West Germany (£1,211,722) and the U.S.A. (£1,122,073).

D.H.C. Caribou Flies

A FIRST full flight was made by the de Havilland Aircraft of Canada Caribou at Downsview, Toronto, on July 30 following short hops the day before. Designed to carry 28 armed soldiers or up to 2½ tons of freight, and to operate from short landing strips, the Caribou has been ordered initially by the Canadian Government on behalf of the U.S. Army and deliveries are due to start next year. Engines are two Pratt and Whitney R-2000s.

Battle of Britain "At Homes"

THERE will be 35 R.A.F. stations open to the public in England, Scotland, Wales and Northern Ireland on the Saturday (September 20) in this year's Battle of Britain Week. Those on view are to include Bomber Command bases where Valiants, Vulcans and Victors may be seen—Cottesmore (Rutland), Marham (Norfolk), Gaydon (Warwickshire), Waddington (Lincolnshire) and Honington (Suffolk). At Fighter Command stations like Acklington (Northumberland), Horsham St. Faith (Norfolk) and Leuchars (Fifeshire) the public will be able to see Hunters and Javelins; Biggin Hill, the only station to be open near London, is—though no longer an operational station—planning a programme comparable with the great displays of past years; at Valley (Anglesey) visitors will see the home of the Guided Weapons Development Squadron and at St. Athan (Glamorgan) and Cosford (Staffordshire) they can inspect two of the largest stations in the U.K., where thousands of boy entrants are trained.

Other stations "at home" will be: Aldergrove (N.I.); Abingdon (Berks); Andover and Thorney Island (Hants); Benson (Oxon); Bassingbourn and Waterbeach (Cambs); Binbrook (Lincs); Chivenor (Devon); Church Fenton, Leeming, Lindholme and Norton (Yorks); Colerne (Wilts); Halton (Bucks); Wattisham (Suffolk); Jurby (I.o.M.); Turnhouse (Scotland); St. Eval (Cornwall); Syerston (Notts); Tern Hill (Salop); Upwood (Hunts); and Weeton (Lancs).

DELIVERY to the Royal Air Force of these twelve Scottish Aviation Twin Pioneers took place last week. The Twin Pioneer will lift sixteen soldiers out of 300 yd strips; or as an ambulance it is able to carry twelve casualties.

S.B.A.C. Show Preparations

THIS year's Farnborough display is to include a guided-missile park nearly half as large again as last year's. One reason is that "live" demonstrations will be staged with some of the weapons, crews showing launching operations and the use of certain equipment in an operational rôle—everything, in fact, but the firing.

Among other new features this year are a second road to the exhibition building, a 30 per cent larger outside equipment display and an improved public address system. There are 330 companies exhibiting, and as several of these will be represented by more than one stand the total number of stands will be rather more than last year.

The display opens on Tuesday, September 2, the preceding day being a Press and technicians' preview day. September 2, 3 and 4 (Tuesday, Wednesday and Thursday) are reserved for S.B.A.C. guests and on Friday, Saturday and Sunday—September 5, 6 and 7—the public will be admitted. Tickets can be obtained at the gates on all three days, but for Friday—and Friday only—they may be bought in advance through the usual agencies. The flying display starts each day at 3 p.m.

Mosquito Memorial ?

AN appeal has been launched for the preservation of the prototype de Havilland Mosquito. This was designed and built at Salisbury Hall, London Colney, near St. Albans, Herts, and on May 15, 1941, flown from there (out of a field 405 yd long) to Hatfield by Geoffrey de Havilland. The intention is that the machine should now be housed permanently at Salisbury Hall, which is open to the public as an historic monument, as a memorial to all those concerned in the aircraft's construction and to all who flew Mosquitos.

The de Havilland Company has offered to re-assemble and maintain the Mosquito, but suitable accommodation is required to house and protect it. An opportunity has arisen of obtaining a hangar for £1,000 and all those who would like to contribute to this cost should send donations to the Mosquito Appeal Fund, c/o Midland Bank, Ltd., 122 Finchley Road, London, N.W.3.

Regional Gliding Winners

COMPETING not only against each other but with most unkind summer elements as well, pilots in the 1958 National Gliding Week (which ended last Monday) put up some sterling and plucky performances. What they had to contend with is indicated by the gloomy statistics that at Dunstable (London Region) there were three "no contest" days out of nine, at Nympsfield (Western Region) four and at Portmoak (Scottish) also four. Moreover on the remaining days conditions were sometimes extremely bad: thus at Dunstable last Sunday, though five pilots got to Podington (near Rushden, Northants), none could get back.

Nevertheless some excellent flights were made on the contest days, pride of place going to Nick Goodhart's to Yarmouth from Nympsfield on Saturday last in his Skylark 3 at an average speed of 60 m.p.h., beating the existing U.K. 200 km speed record.

Sgt. Andy Gough, one of the six pilots in the R.A.F. team at Dunstable, won the London Region contest in his Olympia 419 with 426 points. C. Ellis of the London Gliding Club (Skylark 3) put up strong local resistance to the R.A.F. challenge, coming second with 379 pt; but not far behind him were two other R.A.F. participants—W/C. N. W. Kearon (Skylark 3) with 342 and F/O. D. Cretney (also in a Skylark 3) with 339. Two awards were made for meritorious performances. The B.G.A. prize went to Cretney for his 3 hr 50 min flight to Martlesham Heath and the London Gliding Club prize to R. Ruffett, one of its members, for his flight to Acle, near Great Yarmouth, in the club's Olympia.

Cdr. H. C. N. Goodhart and John Williamson (Skylark 3) were joint winners of the Western Region competition with 274 points; second was G. Burton (Olympia) with 195; third, J. C. Neilan and M. V. Laurie (T.42), with 193; and fourth, Peter Scott (also T.42), one point behind with 192.

G. H. Stephenson (Skylark 3) came first in the Scottish Region; W. N. Tonkyn and B. J. Davey (Skylark 3) were second with 353 and Philip Wills (Skylark 3) had 343 pt; but Stephenson and Wills, who had come to Portmoak to get an experience of Scottish conditions, did not accept prizes—which went to Tonkyn and Davey, A. J. Thorburn and W. Adamson (Olympia), who had 122 pt, and W. Lawson (T.42), with 64.

A NEW GYRON JUNIOR

ALTHOUGH no thrust may yet be quoted, it is now permissible to publish a photograph of the de Havilland Gyron Junior DGJ.10 turbojet. Its designation and appearance both make it apparent that it represents a major advance in the design of the Gyron Junior, and the manufacturers state that, compared with the 7,000 lb-thrust DGJ.1, the new unit gives "greatly enhanced output."

The original DGJ.1 first ran in August 1955, less than a year from the first issue of drawings. Engines of this general type have been extensively flown in a Canberra and also power the Blackburn NA.39 Naval strike aeroplane. One of the family has been exhibited carrying a large air-bleed manifold, and de Havilland Engines probably have more experience than any other company with engines designed from the outset for the supply of very high percentages of bleed air. In the Halford laboratory at Hatfield is a complete system which simulates the behaviour of blown flaps for super-circulation under all operating conditions. The new Junior does not carry an air-bleed manifold, but it is stated to have supersonic applications and to be capable of reheat to 2,000 deg K to give 40 per cent increased thrust (sea-level static). Such an installation would require a sophisticated intake and fully variable con-di nozzle.

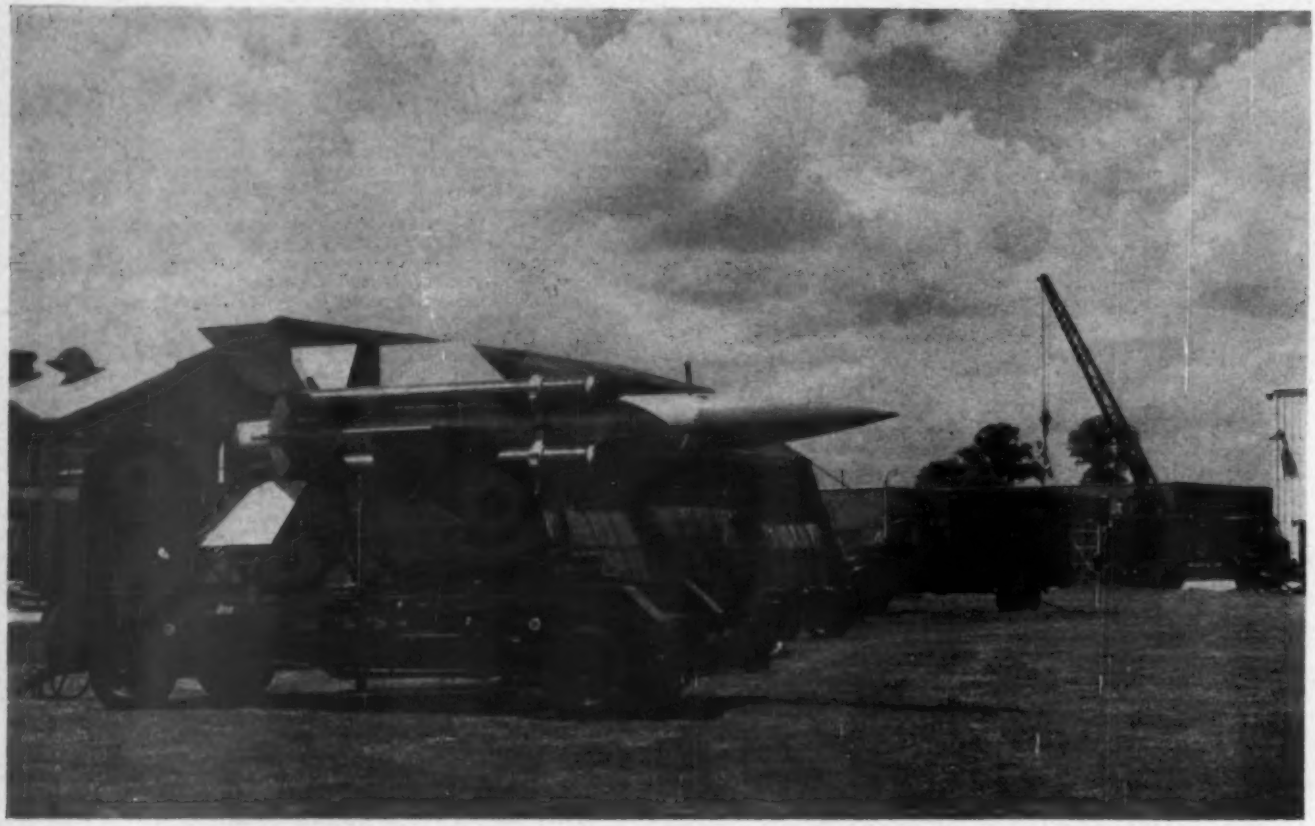
Inspection of the DGJ.10 shows that the engine is longer than its predecessors. At the front is an intake fabricated from sheet-steel, forming a stiff box structure with five struts carrying the front bearing (the Junior probably follows the practice of the larger Gyron in having only two main bearings). The compressor itself is clearly longer than that of early Juniors, and apparently has eight or nine stages of blading. A radially mounted jack is fitted to control the incidence of the inlet guide vanes—like previous D.H. axials—but in the new engine these are also mechanically tied to the first row of stator blades, giving an approximate range of movement of 30 deg on both rows. This is the first time in which variable stators have been seen in a British gas turbine. As the photograph shows, the compressor casing is divided into four portions and the materials used are clearly titanium and steel. The use of titanium for the large forward casings probably represents the most extensive use of this material in a British engine.

There appears to be considerable axial distance between the compressor delivery and the fuel gallery, and this suggests upstream burners (which are known to be used on the Gyron). Two separate fuel galleries are used, in contrast to the single or concentric manifold of the earlier Junior engines, although the number of burners (twelve) is unchanged. The profile of the combustion chamber is completely new and, as previously noted, no air-bleed muff is visible. No illustration of the afterburner has yet been released.

Earlier Gyrons and Gyron Juniors had an integral oil tank surrounding the intake. Presumably the design Mach number of the DGJ.10 corresponds to a ram temperature rise sufficient to cause the oil to coke, as the new engine has a separate oil tank prominently visible in the photograph (earlier Juniors also had a light-alloy intake). Hot air for intake de-icing at low speeds and altitudes is brought forward along the top of the compressor through twin ducts incorporating a Teddington double gate valve. The lowermost intake strut presumably contains drives to the accessory and control group mounted on the underside of the engine. A Dowty fuel system is fitted, the multiple functions of which are all controlled from a single large package integral with the main fuel pumps. It is safe to conclude that the starter is positioned inside the nose bullet and operates either on H.T.P. or low-pressure air.

Possible applications for the DGJ.10 may not be mentioned. It is known that a developed Gyron Junior would have powered the S.R.177 mixed-power intercepter, but in the absence of this programme it must be concluded that the DGJ.10 is earmarked for some aeroplane not yet officially revealed. The new engine is to be exhibited at the S.B.A.C. static exhibition at Farnborough.

The Gyron Junior DGJ.10 is a light and efficient turbojet developed for supersonic applications.

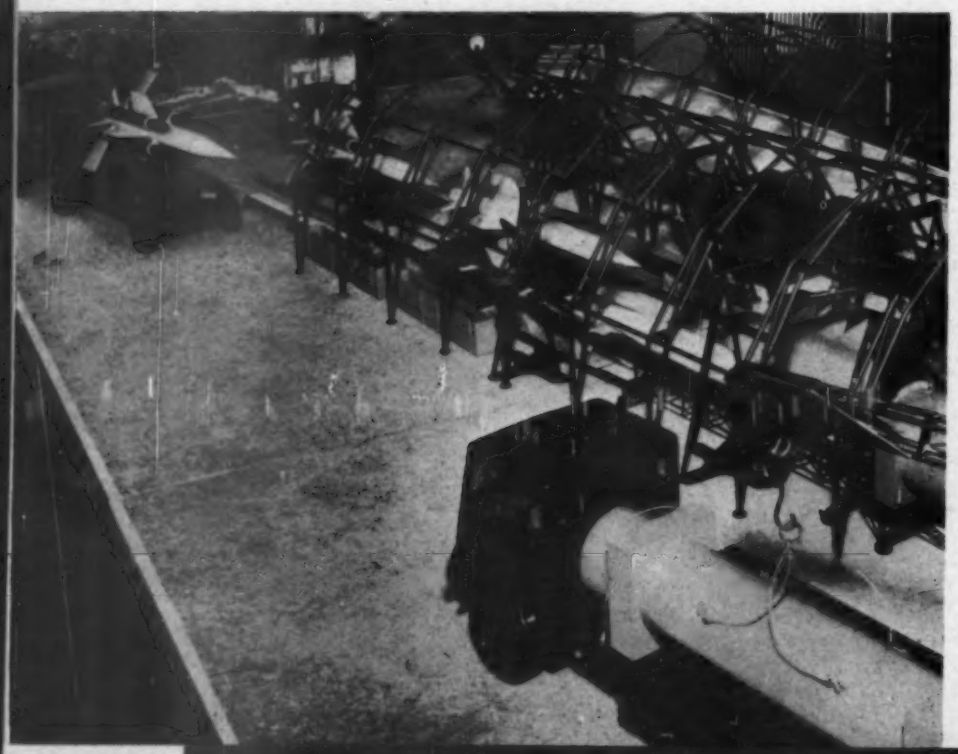


1

Thunderbird's Nest

A PREVIEW OF THE ENGLISH ELECTRIC ANTI-AIRCRAFT SYSTEM

2



ON these pages are photographs which give an outline of the manner in which the English Electric Thunderbird surface-to-air guided weapon is transported, stored, assembled and launched. Thunderbird is coming into large-scale production for the British Army and is also in production, in an almost identical form, for the Royal Air Force. It has already been stated that it is being developed in a number of advanced forms, and these photographs refer only to the initial production version.

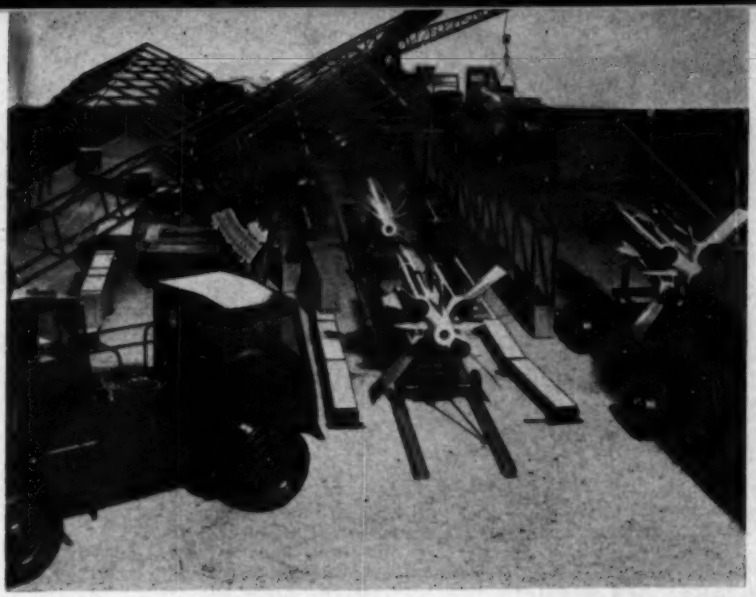
The missile has a cylindrical body of finely streamlined form, which in production versions appears to be divided into sections joined by manacle rings tightened by turn-buckle bolts. At the front is a pointed ogival nose, which is of di-electric material transparent to the missile's semi-active homing radar. From the foremost metallic body section protrude four spike aerials—presumably for Doppler radar—which are shielded by protective covers while the weapon is on the ground. The bulk of the space inside the body is occupied by the large solid-charge sustainer motor, the gas from which exhausts through a narrow tube passing through the centre of the aft control ring to issue as a propulsive jet from a divergent nozzle at the squared-off rear end. Around the mid-section of the body are attached the four cruciform wings, each of which is exceedingly thin, has sharp edges and a biconvex section. Each wing is attached at five points along its root, the anchorages being forgings secured to the body structure by bolts on either side of the wing. The parallel-double-wedge control surfaces are each anchored by their pivot axes and are disposed in line with the wings. Between these aerodynamic sur-

faces are arranged the four boost motors. These are secured by strong rings at their forward ends which clamp the boosts to each other and to the missile body. At the rear are curved spigot attachments so that when the boosts have burnt out they can slide to the rear, unlock at their forward ends and then at the correct point in the separation cycle part cleanly from the missile itself. Stabilization of the boosts is ensured by fins at their rear ends, there being one large central fin, with inverse taper, and two small lateral fins.

Thunderbirds are manufactured at the English Electric plant at Stevenage, Herts. With wings, fins and boost motors removed, the live rounds are packed in special containers consisting of a cylindrical drum with square sections at either end (Fig. 2). These containers are extremely strong and can withstand heavy impacts, the missile being flexibly suspended through shock-absorbing mounts. The air in the container is dried and filtered, the whole then being sealed to permit storage of the weapon in any climate for several years without deterioration. When the missile is required for use it is withdrawn from store and taken by truck to the field assembly and test point (F.A.T.P.) which is shown in Fig. 3 in 1/24th scale model form.

Here it is unshipped and placed within one of the bays of the F.A.T.P. There can be any number of bays in an F.A.T.P., each of which is constructed from welded steel tube with a fabric covering. In the photograph, one bay is used as a store-room and the other for assembly and checking. The newly received round is carefully aligned in the latter bay, and the end of its container covering the semi-active homing receiver in the nose of the missile is then removed to enable the response of the latter to be checked. All testing is of the go/no-go type and can be completed very rapidly.

The accepted round is then lifted on to its assembly and boosting trolley (Fig. 4) where the wings and fins are added. The latter are removed from storage cases which normally hold groups of four. The assembly and boosting trolley is then towed



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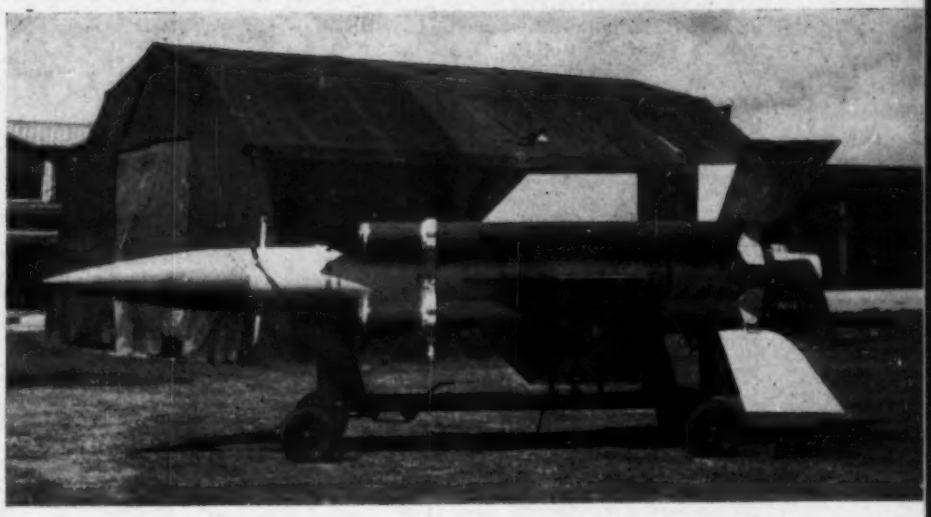

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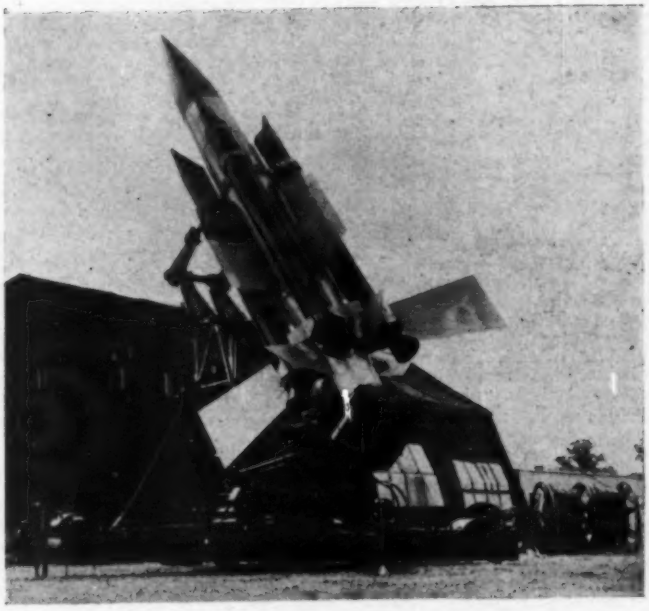


5

to the final station in the F.A.T.P. where the boosts are clipped on and final checks performed. It will be observed that the supply of boost motors and other components is facilitated by a roller conveyor along each side of the assembly and test bay.

From the assembly and boosting trolley the missile is transferred by crane to the launcher-loading trolley (Fig. 1). This vehicle has cross-country performance and would normally be that employed during transport of the weapon by road. On its chassis is mounted a turn-table which carries an elevating frame from which the weapon is actually launched. The missile is supported in zero-length manner from lugs on the underside of each of the lower boost motors. At the rear is a fly-off head through which all services are passed to the missile, the connections being broken automatically as the weapon leaves the launcher upon firing.

The launcher itself (Fig. 5) likewise has full cross-country performance when mounted upon its wheels. Normally, however, it would be bedded down horizontally at a selected site and would thereafter be progressively recharged by the launcher-loading trolley. The latter is brought alongside and the weapon and elevating frame turned through 90 deg, in which position the complete assembly can be slid off on to the launcher itself.

HERE AND THERE

CZECH TEAM in the World Parachuting Championships now in progress at Bratislava (see p. 213): l. to r., Ryba, Ozábal, Krivón, Koubek, Jehlicka, Kaplan. The aircraft is an An-2.

Air League Post

APPOINTED secretary-general of the Air League of the British Empire in succession to Mr. F. N. Hillier, who retired last year, is A.Cdre. G. J. C. Paul, at present Director of Operational Training at the Air Ministry. Due shortly to retire from the R.A.F., he will take up his new duties in October.

Amy Johnson Mementoes

TROPHIES and other awards presented to the late Amy Johnson during her flying career have been offered by her father, Mr. J. W. Johnson, to Bridlington Corporation.

A. V-M. W. E. Barnes

PRINCIPAL Medical Officer with the 3rd Tactical Air Force in Burma from September 1944 until the end of the war against Japan, A. V-M. W. E. Barnes died on July 28 at the age of 61. From 1948 to 1950 he was Deputy Director-General of R.A.F. Medical Services and then Principal Medical Officer, Home Command, until his retirement in 1953.

A British Anti-Missile?

DURING his visit to Australia, Mr. Aubrey Jones, British Minister of Supply, announced that Britain is investigating the problem of providing a defence against long-range ballistic missiles. He also expressed this country's intention to make greater use of the Australian Jindivik target drone, ten of which had been ordered.

Bonanza's Record Flight

A NON-STOP flight of 6,979 miles from Manila to Pendleton, Oregon, was completed on Friday, August 1, by Capt. Marion Boling, a United Airlines pilot, flying a Beechcraft Bonanza. The previous record for a non-stop unrefuelled flight by a single-engined light aircraft was that of the late Capt. William Odom, who flew 4,957 miles from Honolulu to Teterboro, N.J., also in a Bonanza, in March 1949.

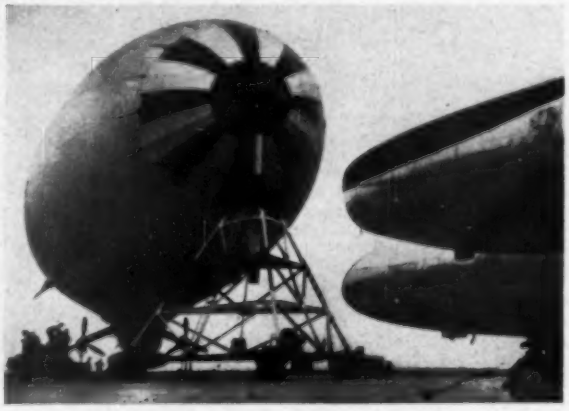
Wings for the Mi-6

IN its latest form Russia's Mi-6 helicopter —the world's largest—has smallish wings mounted at shoulder level, with their leading edges roughly in line with the attachment of the undercarriage struts. By thus unloading the rotor the Russian designer Mil has further increased the speed of an already fast helicopter.

Arctic Airship

BAD weather has dogged the U.S. Navy ZPG-2 airship since it left Weymouth, Mass, on July 27 on the first leg of a flight which is to take it within 600 miles of the North Pole. Its destination is T-3, a floating ice island weather station in the Arctic Ocean manned by U.S. scientists doing work for the I.G.Y. Last Sunday this Goodyear airship left Akron, Ohio, for a third attempt.

ZPG-2 airship at mobile mooring-mast during preparations for its polar flight (see news item, this page). Getting into the picture is a B-45.



SPUTNIK 3 replica (left) is the latest attraction on the Soviet stand at the Brussels Fair. Charts indicate hour-by-hour progress of the original in its orbit.

Russian I.G.Y. Rockets

AT a meeting of the Soviet I.G.Y. committee in Moscow recently the chairman, Academician Ivan Bardin, said that during the I.G.Y. the U.S.S.R. had launched 59 rockets, one of which rose to a record height of 473 km (295 miles).

Another Tissandier Award

AWARDED a Paul Tissandier diploma for his services to aviation Col. Rod Douglas is the third South African to be so honoured. Co-founder (in 1927) of the Aero Club of South Africa, he was one of that country's first commercial pilots and civil flying instructors and during the last war was S.A.A.F. director of air personnel.

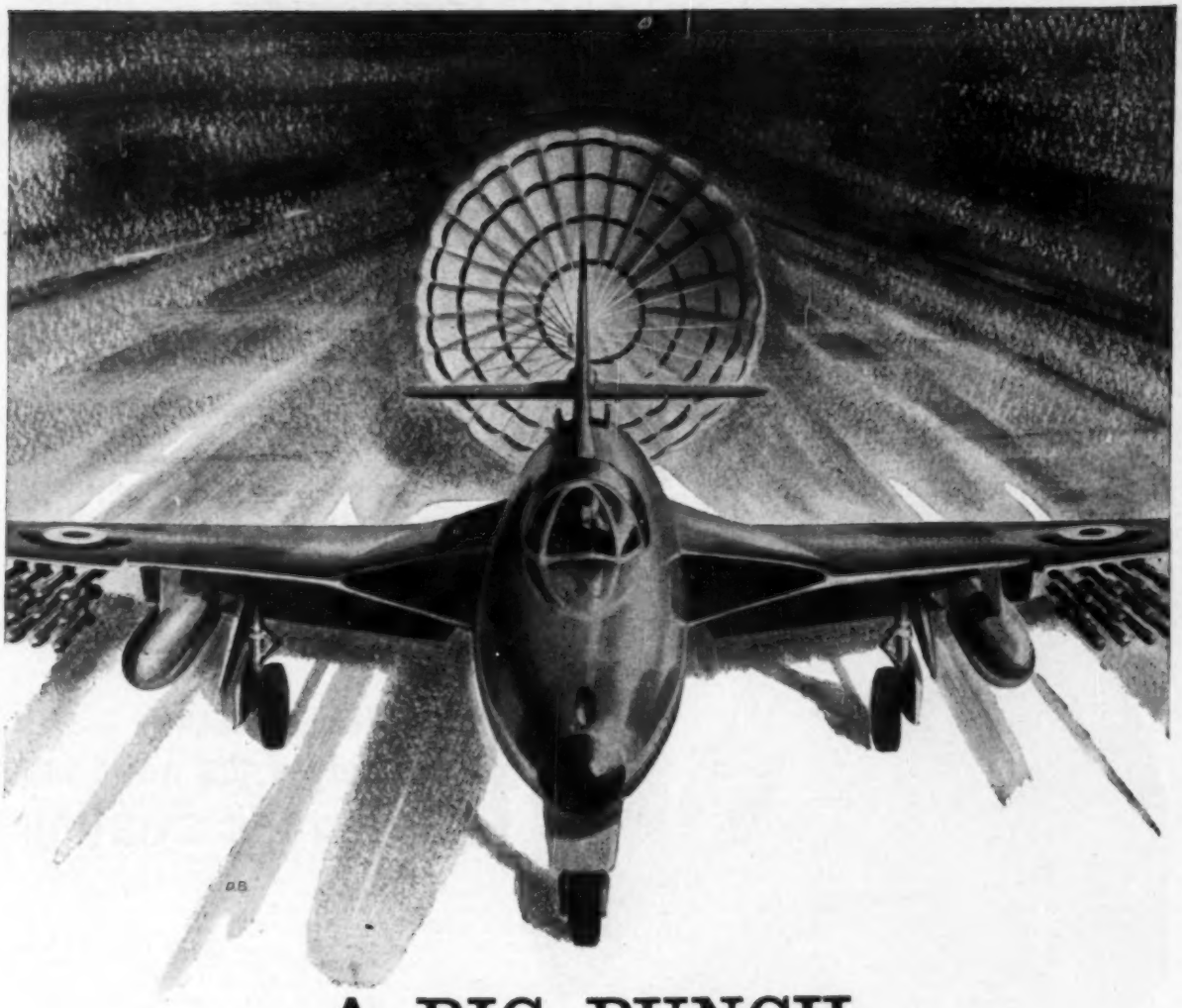
M.o.S. Appointment

IT has been announced by the Ministry of Supply that Maj-Gen. L. E. Cutforth, K.B.E., C.B.(Ret.), has been appointed Director-General of Inspection in succession to Sir Thomas Barnard, C.B., O.B.E., who is retiring from the public service. Gen. Cutforth is due to take up his new appointment on October 1 this year.

I.G.Y. Conference

BRITAIN'S delegation to the fifth meeting of the special committee (C.S.A.G.I.) of the International Geophysical Year, which started its meetings in Moscow on July 29 and ends them tomorrow (August 9), is being led by Sir David Brunt, British delegate to the Advisory Committee for the I.G.Y. Among the delegation's 16 members are Mr. W. T. Blackband and Mr. E. C. Cornford of the R.A.E. Farnborough.

"Couldn't stand being cooped up in an office."

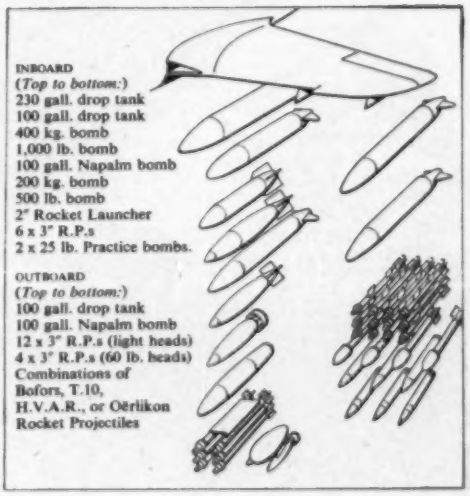


A BIG PUNCH

does not need a big airfield

A braking parachute enables the Hunter F.6 to operate from small airfields. Indeed, even without the parachute, it has been operated from 1,500-metre runways under the most difficult test conditions, the take-off being at some 21,000 lb. all-up weight, and the landing with two 1,000 lb. bombs or 24 rockets still in place.

This means that this most powerful of ground attack fighters can follow the troops right to the front. Military commanders can count on the full force of the heaviest fixed gun armament on any fighter – four 30 mm Aden guns – and the greatest load of bombs, missiles or rockets. The Hunter's ability to carry as standard fitment 660 gallons of fuel in drop tanks also gives it outstanding range for tactical reconnaissance. With the Hunter's proved performance and manœuvrability, this truly adds up to the finest ground attack fighter in the world.



HAWKER HUNTER

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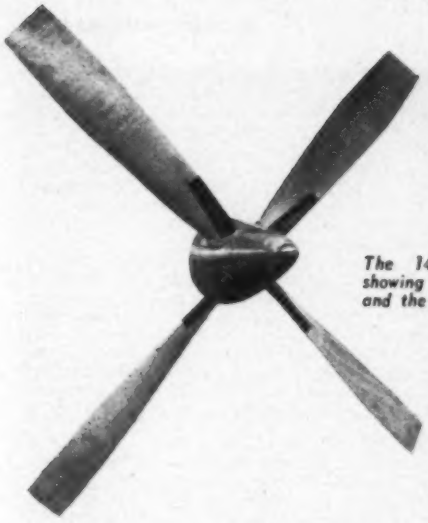
The Vanguard's Propellers

ABSORBING THE TYNE'S 5,000 s.h.p.: SAFETY AND CONTROL FEATURES OF DE HAVILLAND PROPELLERS DESIGN



The 14ft 6in propeller, showing the conical spinner and the de-icing overshoes.

WHEN the design for the propeller equipment of the Vickers Vanguard was first studied by de Havilland Propellers, Ltd., it immediately became clear that a propeller would be required with safety and handling characteristics superior to those of any unit previously produced. Extensive discussions ensued between de Havilland, Vickers-Armstrongs, Rolls-Royce (who manufacture the Tyne turboprop which powers the Vanguard) and potential customers both in Europe and America.

The success of the Viscount encouraged all concerned to consider very carefully trends in the U.S.A., as well as operators' opinions on what an ideal propeller should be able to do. It is not surprising, therefore, that the de Havilland propeller now entering production for the Vanguard contains several features which, although held in high favour on the other side of the Atlantic, are new to this country.

Outwardly the propeller has a clean, businesslike appearance. Its diameter—14ft 6in—is not large for a modern propeller, but the four Duralumin blades are relatively wide and of a slightly unusual plan-form. Short de-icer overshoes and a conical spinner complete the impression of robust efficiency. It goes without saying that the blades are designed to combine high thrust at take-off with the best possible efficiency at fast cruising speeds; but it is difficult to convey in a few words the vast amount of research and design effort that has been put into the choice of blade characteristic to give the minimum weight consistent with the requirements for performance, structural integrity and the provision of adequate torsional stiffness to resist stall flutter. The propeller currently in production has a maximum blade-width of 16.4in, but a developed form will be produced to match the aircraft requirements when weight is increased. The later propeller will have a maximum blade width of 20.5in.

Spinner. Originally an ellipsoidal spinner was submitted and is in fact being used for development flying. Later, however, the design was changed to one having a conical section, as this shape gives a better pressure recovery in the annular air intake just behind the propeller. The conical spinner presents a more difficult design-problem. The blade roots enter the spinner through a conical surface, and consequently the root fairings can blend perfectly with the spinner surface at one particular pitch angle only.

At one time it was suggested that blades with cylindrical roots would overcome this difficulty; but the adverse effect of such a root on the efficiency of the air intake caused abandonment of this design. As so often happens in engineering, the final solution is a compromise between intake efficiency at an average high-speed cruise blade angle, and as little interference as possible with the airstream at all other blade angles.

Secondly, the de-icing problem is difficult. With a spinner of elliptical section it is necessary to de-ice only a comparatively small area around the nose. Behind this area the airstream tends to leave the spinner surface and does not deposit ice upon it. With a conical spinner, on the other hand, the stream will follow the spinner surface more closely and is likely to deposit ice all the way. Consequently, unless and until experience disproves this theory, the entire spinner surface, and the root fairings, will be de-iced by internal heaters.

Turbulence in the intake can also originate from a cross-flow of air at the gap between the back of the rotating spinner and the engine nose. On the Vanguard this possibility is being reduced to the absolute minimum by providing a labyrinth seal at this point.

Another innovation in spinner design is the single-point combined attachment and extraction device. By application of a simple tool rather like a large Allen key to the locking mechanism concealed in the nose the spinner can be screwed firmly into place or jacked off. The advantage thus conferred—in comparison with the conventional dozen or more peripheral attachment screws with no provision for extraction—will be readily appreciated, particularly by any engineer who has found his arms just too short to embrace a spinner and pull it away without falling off the service platform.

In order to deal with the increased twisting moments of wider propeller blades a new size of hydromatic pitch-change unit with a 10in-diameter piston has been designed, and the first of this size to go into production will be for the Vanguard. Compared with that of the previous largest pitch-change unit the increase in diameter is only seven-eighths of an inch, but it gives about 20 per cent more piston area and enables the working pressures to be kept down to conventional levels. To maintain the same maximum rate of blade-pitch change, however, the pump in the propeller controller unit would have to be increased in capacity by this percentage. It has in fact been increased by only 10 per cent, but the rate of pitch change which this gives in the governing band is ample for a system having the throttle and r.p.m. selection interconnected.

Flight Safety. In the light of the searching failure-analysis they have carried out, de Havilland Propellers consider the Vanguard propeller to be as safe as it is possible to make it. Briefly, the object of the safety devices (see "Propeller Safety," *Flight*, April 25) is to make sure that, no matter what may go wrong with the propeller, the propeller control system, the engine controls, the engine oil system or the fuel system (or even if two or three of these items go wrong at the same time), the propeller will not assume too fine a pitch, and thus cause either excessive drag or dangerous overspeeding. For comparatively slow-flying piston-engined aircraft a mechanical fine-pitch stop (only withdrawn on the ground) and a hydraulic pitch-lock have always given adequate protection. With the advent of high-powered turboprop engines more safeguards have become necessary. An improved version of the mechanical fine-pitch stop has been designed. This consists of 24 finger-type stop bolts which engage the stop ring; when the power lever is moved to the ground handling "beta" range, high-pressure oil moves a restraining disc plug, thus enabling the pitch-change piston to ride over the stop bolts into the low-pitch range.

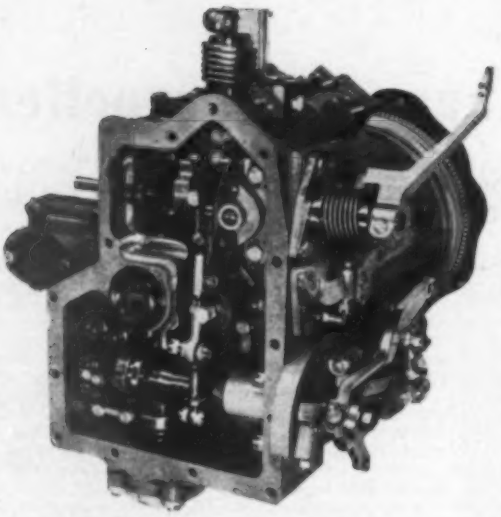
At first it was thought that the addition of a second fine-pitch stop in the middle of the governing range would be a simple and neat solution to the added safety requirements; this stop would be withdrawable in flight to enable the propeller to govern down to finer angles when necessary. But a careful study revealed that, owing to the wide speed-range of the Vanguard, one additional stop was not enough and that two would be required in order to keep drags or overspeeds down to reasonable proportions. However, when the complete system was laid out, with all the necessary automatic operations and warning lights, its complexity dictated rejection of the idea.

The next scheme considered was the provision of a variable-setting overspeed pitch-lock, with the speed-sensing mechanism in the controller at a point where its setting could easily be varied and kept at a small percentage above the selected r.p.m. In the event of an overspeed the third oilway between the controller and the propeller would be connected to drain, and the resulting loss of pressure would bring in the pitch lock. This scheme was eventually defeated by the feeling that the speed-sensing device should be put in the component which it is intended to protect.

And so the present system was evolved, in which the complete centrifugal pitch-lock, which has two speed-settings, is housed inside the pitch-change unit in the propeller hub. The higher speed setting gives protection at take-off, while the lower is in use at all other flight conditions.

Automatic selection of the correct speed setting is performed hydraulically by the propeller controller via the third oilway (the same oilway that is used to withdraw the flight-idle stop) by providing three distinct oil pressures in this line. At zero pressure the flight-idle stop is in position and the lower pitch-lock speed setting is selected; at an intermediate pressure the pitch-lock speed setting is raised, with the flight-idle stop still being operative; and at a higher pressure the flight-idle stop is withdrawn after touch-down to allow the propeller to pass down to finer pitch angles for braking and ground handling; the overspeed pitch lock, being no longer required, is mechanically held out of engagement.

The full list of safety features is as follows: (a) an automatic



The multi-purpose controller with cover removed.

THE VANGUARD'S PROPELLERS . . .

hydraulic pitch-lock responsive to loss of control pressure; (b) an automatic mechanical pitch lock responsive to both loss of control pressure and propeller overspeeding; (c) a mechanical flight-idle stop; (d) a secondary electro-hydraulic flight-idle stop; (e) as a hydraulic stop with an angular setting automatically varied to follow up the blades into the constant speeding zone, while remaining far enough below them not to interfere with constant speeding; (f) an automatic hydro-mechanical drag-limiting control, sensitive to engine shaft torque; and (g) two independent means of feathering.

The first three of these devices are built into the pitch-change unit in the hub; the remainder are part of the propeller controller unit which is mounted on the engine reduction gear and driven by the engine low-pressure compressor system.

Propeller Controller. Since the days of the simple hydromatic constant-speed unit from which it is descended, the controller has grown more than has any other propeller ancillary. Nevertheless, taking into account the many functions this unit has to perform it is notably compact. In addition to controlling the speed of the propeller automatically at the r.p.m. appropriate to the engine throttle opening selected by the pilot, and pumping 25 gallons of oil per minute for this purpose, it has to:—

(1) Withdraw the flight-idle stop.
(2) Change the setting of the overspeed pitch lock.
(3) Provide a means of checking the function of the overspeed pitch lock by setting it down to its lower datum although the engine is running at higher r.p.m.
(4) Receive a mechanical signal of engine shaft torque and translate it into a hydraulic signal to coarsen the propeller (safety device *f* in the list above).
(5) Provide the electro-hydraulic stop (safety device *d*).
(6) Provide an electric signal to operate an indicator light to tell the pilot when the propeller blades have passed below the flight-idle stop.
(7) Provide two means of feathering, one hydro-mechanical and the other electro-hydraulic.
(8) House an electric actuator for synchronizing and synchrophasing the propellers.
(9) Become a positional servo unit for obtaining any required blade pitch angle from full reverse pitch (minus 24 deg) to flight idle (plus 15 deg), and, by continuing this function into the flight zone, to provide the follow-up stop (safety device *e*).

Considering the many functions of the control system, an unusual feature for a modern British aircraft of this size is the very small use made of electrics. This should not be taken as a reflection on the reliability of electrical control systems, for there are many good aircraft—notably the Britannia—in which most of the control functions are performed electrically. In the case of the Vanguard, however, the aircraft designers and potential operators, including those in the United States, preferred the simplicity and mechanical robustness of mechanical controls. Consequently, in the Vanguard propeller system all the major controls are hydro-mechanical, and the use of electrics is restricted to de-icing and such secondary functions as synchrophasing, testing and warning lights, and for driving the feathering-pump motor.

Synchrophasing. Much of the noise inside an aeroplane emanates from the propellers. In addition to the fundamental noise (which would occur even if it were possible to have a perfectly balanced and completely isolated propeller), there are interactions between the blades and parts of the aeroplane, and between the tips of adjacent propellers. If the propellers are perfectly synchronized the frequency of the vibrations from each propeller is the same and there is no "beat." The noise level is steady and is less tiring to passengers and crew than the periodic rise and fall of noise level caused if the propellers are not running at exactly the same speed. But if, in addition to synchronizing the propellers, it is possible to manœuvre them and hold them so that the blades of adjacent discs are in a phase relationship which causes vibrations of a minimum amplitude—termed "synchrophasing"—then the general noise level will be still further reduced.

Synchrophasing is achieved by the use of a tacho-generator mounted on each engine and driven at four times propeller-shaft speed. Each generator supplies the phase and r.p.m. references for the relevant propeller. These references are fed into the synchrophaser control, where the signals from the slave engines are compared with those of the master; should there be a difference, an amplified corrective signal is sent to the appropriate slave actuator. The actuators, which are housed in the heads of the propeller controllers, vary the setting of the governor spring according to these signals.

The system is designed to synchronize the slave propellers if they are set to within 10 r.p.m. of the master propeller and to maintain blade-phase relationship to within 8 deg under all normal operating conditions. This figure, however, will be exceeded temporarily during transient conditions. No electronic valves are used in the synchrophaser control, magnetic amplifiers being employed to boost the signals, and the only moving parts are the rotors of certain synchronous machines.

The Vanguard will be the first aircraft to go into service in this country with synchrophasing as standard equipment.

Beta Control. The final function of the controller to be mentioned, that of manually controlling the blade-pitch angle, has come to be known as beta control. It is perhaps the greatest innovation in propeller control systems since the advent of the reversible-pitch propeller, and will go into service in this country for the first time on the Vanguard propeller. It should be made clear that this system, apart from providing a follow-up stop in the flight zone, is used only with the aircraft on the ground, and was originally devised and developed in the United States, where it has been successfully tried out on a number of turbine installations.

A full description of beta control and its advantages would fill several pages and is clearly outside the scope of this article. It may be summed up by saying that the pilot, by using one lever only, can select any required engine power and the appropriate r.p.m. from take-off down to flight-idle in the normal manner, but can also, by moving the lever through a gate, withdraw the flight-idle stop and select any blade-pitch angle he desires between flight-idle and full reverse pitch. Thus, any value of positive or negative thrust may be selected by the pilot as smoothly or as suddenly as it is required.

Very sensitive control of thrust or drag is thus provided, so that landing on icy runways should be safer with beta control than with conventional reversible-pitch propellers. In this respect, beta control compares very favourably with other propeller control systems in which there is a sudden and uncontrolled drag as the blades move down to the ground-idle stop when the flight-idle stop is withdrawn, followed by a further increase in drag as the blades pass into reverse pitch.

A Tyne engine with beta control system has already been run on the bench. If, under service conditions, its inherent safety and smoothness of control for ground handling match the results already achieved beta control should become extremely popular with Vanguard aircrews.

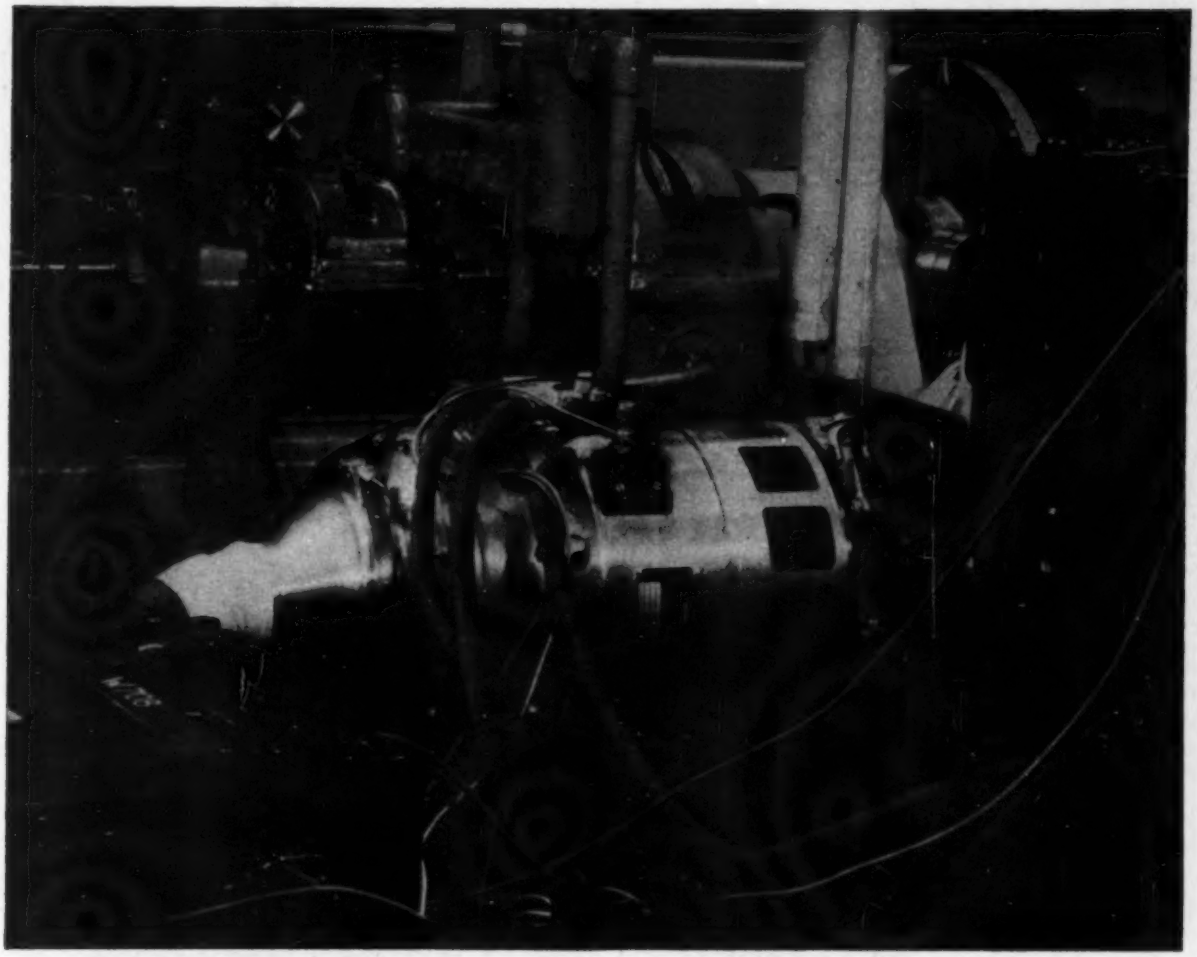
TWIN-COMPARTMENT LIFEJACKET

A NEW inflatable lifejacket for aircraft and marine use is claimed by its makers—the R.F.D. Co., Ltd., of Godalming, Surrey—to have twice the buoyancy of, yet to be cheaper than, any other airline-approved twin-compartment jacket. It is also stated to be the first British lifejacket to have twin buoyancy compartments.

The new jacket is an addition to the existing R.F.D. range and will not supersede the company's single-compartment design. Buoyancy has been increased by 20 per cent in comparison with the single-compartment type. Either compartment is capable of supporting the survivor at the correct angle in the water with his or her face well above the surface. Each compartment has its own mouth inflation valve for topping-up.

The marker light has a minimum duration of 20 hours and operates automatically on entering the water. A whistle is provided as an additional means of attracting attention. The jacket can be made in different colours if crew identification is required.

Two versions are available: Type 58 (one cylinder), weighing 1 lb 10 oz; and Type 66 (two cylinders), 1 lb 14 oz. Either lifejacket can be stowed in the American-type seat-back pack.



English Electric brushless air cooled alternator on test in the Bradford Laboratories

Now the Brushless Alternator

1954 ENGLISH ELECTRIC proposed first constant frequency A.C. main generating system for use in British aircraft.

1956 First practical constant drives to be manufactured in this country, and first British A.C. main generating system, designed by English Electric, were on test.

1957 This system first flown in British aircraft.

1958 First air cooled brushless alternator designed and manufactured in this country for main generating system in aircraft, now on test in English Electric Bradford Laboratories.

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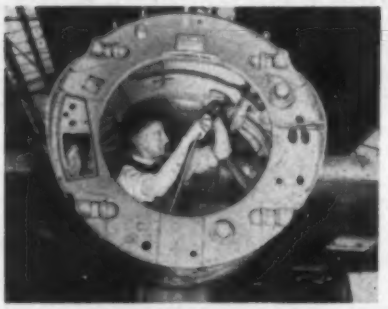
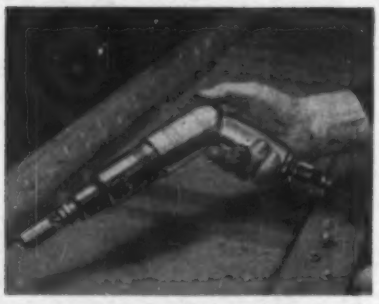
The Mighty Atom Corner Drill reaches any awkward spot. This M2 model is being used on the engine mounting of a Vickers Viscount. *Photograph by courtesy of Vickers-Armstrongs.*



A Desoutter Rackfeed Drill reaming holes in the centre section of an Avro Vulcan bomber. *Photograph by courtesy of A. V. Roe & Co. Ltd.*



Another widely used tool in the aircraft industry is this Desoutter Bolt Miller.

Drilling and countersinking rivet holes with Desoutter power tools on the fuselage skin of a Vickers Vanguard. *Photograph by courtesy of Vickers-Armstrongs.*

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CDC 299

Aeronautical Bookshelf

A diagram from Maj. Oliver Stewart's "Danger in the Air," illustrating typically confusing readings of the conventional type of three-hand altimeter, in which the hands tend to obscure one another. In the text he points out that the worst confusion is apt to occur in the presentation of the heights 1,000ft, 11,000ft and 11,100ft.

Danger in the Air, by Oliver Stewart. Routledge and Kegan Paul Ltd., Broadway House, 68-74 Carter Lane, London, E.C.4. Price 28s.

AIR crashes, by their nature, make big headlines. They are often utterly final, accompanied by big death-rolls, completely wrecked aircraft and a severe loss of public prestige by the operator involved. Extensive and expensive precautions are taken to prevent accidents, foolproof devices are fitted in aeroplanes and along the routes which they fly; designers are striving all the time to build aeroplanes which *cannot* crash—and yet there are still frequent mishaps.

Crews often diplomatically avoid discussing accidents, except privately among themselves, and it is occasionally considered a little *infra dig.* to mention the subject. In *Danger in the Air* Oliver Stewart has ignored this strange sensitivity and brought into the limelight a most important subject; yet he has employed no tinge of sensationalism. He has written a considered, but not cold, chronicle of air accidents and has shown as far as possible how each happened, why it happened and how it could perhaps have been avoided. Maj. Stewart is frequently outspoken, always entirely honest and completely convinced of the views he puts forward. His long experience of aviation has made him a severe and immensely knowledgeable critic; to those who do not know him his style of writing may sometimes suggest conceit—particularly so (in this book) his description of the crash of the D.H. 110 at Farnborough in 1952. But it is important for the author of a work of this nature to call on his own memory and not just to refer to official reports.

He says forthrightly that he disagrees with certain of the views of those officials who investigated some of the accidents about which he writes. In particular, he decries the rather frequently held official view that many accidents are due to pilot error. Many accidents years ago were caused largely by the pilot misjudging a manœuvre or getting himself into a position which for recovery called upon 100 per cent reliance being placed on the quality of the aeroplane. Sometimes the aeroplane failed, and then the imperfections of its structure should have been held at least partly to blame. This blaming of the pilot has followed us through the years, and Maj. Stewart points out forcibly that accidents which have been attributed to pilot error were, in his opinion, caused by errors by one or other of the Ministries concerned with the aircraft: "Ministries seem to be almost immune from criticism by the courts they set up, whereas the pilot is regarded as fair game . . . it may be convenient to Government departments, but it is not just to pilots," he writes. "With the spread of responsibility between hosts of different people, including many officials on the ground, it is wrong to accept the verdict of pilot error without the completest and most convincing evidence."

The book emphasizes the technical, not the human, side of crashes, and presents a mass of information on some of the best known and spectacular aviation accidents. There is a lesson, sometimes several lessons, to be learned from each and the book adds usefully to our knowledge of a subject which can vitally affect everyone. Maj. Stewart opens his book with a description of the crash of the R.101 airship at Beauvais in October 1930, how it happened and the events which led up to it, and goes on to deal similarly with more than a dozen different occurrences. This is not a book to be read straight through, but one to be mused over by pilots and operators—and even by some passengers. They will learn a great deal about the danger which awaits the unwary aviator.

A. C. B.

Landing Gear Design, by H. G. Conway. A Royal Aeronautical Society Textbook. Chapman and Hall, Ltd., 37 Essex Street, London, W.C.2. Price 56s. Illustrated.

FEW modern textbooks have been written solely for the aeronautical engineer, and the Royal Aeronautical Society's sponsorship of aeronautical textbooks and monographs has been well received. The first textbooks in the series, *Aircraft Hydraulics Vols 1 and 2*, were edited by H. G. Conway, who has now contributed a work of his own to form the third volume in the series.

There is no doubt that Mr. Conway enjoyed writing this book: each chapter is infected with his enthusiasm (quite an achievement for a textbook) and in length and detail this very comprehensive volume reflects the author's experience and knowledge of his subject—acquired in some 15 years' design and production experience of British undercarriages. To students of undercarriage design it would be an essential buy at almost any price. Others will be technically the poorer for not having read it, but many will think twice before spending 56s to add it to their shelves. It is a pity that the price of these R.Ae.S. textbooks must be so high, because a library copy is a poor substitute for a personal volume on the study shelf.

Undercarriages are a balanced blend of the sciences of kinematics and hydraulics and the engineering of structures and small mechanisms. Each aspect is adequately dealt with in the 336 pages of text and in photographs, sketches and drawings. The quality of the illustrations is, in general, very high, although drawings of undercarriage legs in the extended and retracted positions might be easier to follow if an intermediate stage could have been included.

Quite the most fascinating chapter is the one devoted to retraction, which lists most of the known basic systems and explores some of the difficult problems of geometry (often three-dimensional) that have to be solved to put a complicated landing gear in a small and awkward space. When the last page has been read there can be little to add to the knowledge that this book sets out of the present state of the undercarriage designer's art.

A. T. P.

The Phantom Major, by Virginia Cowles. Collins, St. James's Place, London, S.W.1. Price 16s. Illustrated.

THIS is not strictly an aviation book, although its main characters spent some part of their lives in the Second World War destroying German and Italian aircraft on the ground. The story of the Special Air Service Regiment and its leader Maj. David Stirling has become something of a legend. They were a unit of exceptional men whose veins seemed to have running in them some of the blood of the plunderers and pillagers of olden times. In the Western Desert they staged raids on Axis airfields which left more destruction behind them than a full-scale R.A.F. bombing raid. They endured terrible hardship, they experienced some frightful defeats, but they had a host of brilliant successes, each of them spiced with a measure of humour—of the spine-chilling kind. Virginia Cowles has written their story brilliantly with the help of the memories and diaries of many of "the phantom major's" own men.

A. C. B.

Proceedings of the International Conference on Fatigue of Metals 1956. The Institution of Mechanical Engineers, 1 Birdcage Walk, Westminster, London, S.W.1. Price £4 10s 0d. Illustrated.

LATE in 1956 the Institution of Mechanical Engineers, in co-operation with the American Society of Mechanical Engineers, held a conference on metal fatigue which was attended by 635 members and visitors in London and nearly 7,000 A.S.M.E. members in New York (as many as twelve groups of papers were discussed simultaneously in the two capitals). The entire proceedings of the conference have now been collected between covers and they can be fairly said to represent a complete statement on man's understanding of this vexed subject at the mid-point of the twentieth century. The majority of the papers (which are published complete with the ensuing discussions) concern relatively general aspects of fatigue and engineering design, but aeronautical influence is widely apparent and airframe and aero-engine experience is, in any case, well covered.

The collection cannot be termed a reference book, and it will therefore be of little use to the busy stressman or designer who feels that he cannot afford to buy a copy or to devote many hours to pondering through its 961 pages. On the other hand, it is a work which should be owned by any concern engaged in the business of the design and fabrication of metal structures, and it should not be allowed to rusticate on the shelf.

W. T. G.

The Rainbow and the Rose, by Nevil Shute. William Heinemann, 99 Great Russell Street, London, W.C.1. Price 16s.

FLYING, and the flashback over entangled lives, are familiar ingredients of Nevil Shute's novels. His latest, taking its title from Rupert Brooke's sonnet *The Treasure*, follows the same pattern. A pilot with an Australian airline hears that Johnny Pascoe, who taught him to fly at a Yorkshire flying club in the early 1930s, has crashed in a remote part of Tasmania after attempting to evacuate

AERONAUTICAL BOOKSHELF . . .

a sick child and is dangerously ill with a fractured skull. He decides to try to fly in a doctor; but by the time his attempt succeeds Johnny Pascoe is dead.

Such are the bare bones of the story; but in telling it the author retraces Pascoe's life through the mind of his ex-pupil—the fighter squadron days on the Western Front, his short-lived wartime marriage with an actress, his post as C.F.I. at the flying club and his tragic love for one of its women members, whose husband is in a mental home and by whom he has a daughter. Pascoe's daughter by his wife, and his illegitimate daughter, both turn up at the small Australian township whence his ex-pupil makes his rescue attempts; and the story is told with that blending of down-to-earth realism, sympathy for human courage and weaknesses, and underlying poignancy which characterize Nevil Shute's fiction. Those who simply like the way he thinks up a good story and tells it convincingly will enjoy this new one; those with a particular interest in flying as it was will enjoy some of the nostalgic descriptions—for example, this one:—

"Those rotary engines . . . the Le Rhônes, the Monos, and the Clergets! They made a sort of crackling hiss, and always the same smell of castor oil spraying backwards down the fuselage in a fine mist over your leather helmet and your coat. They were delightful to fly, the controls so light, the engines so smooth-running. Up among the sunlit cumulus under the blue sky I could loop and roll and spin my Camel with the pressure of two fingers on the stick beside the button switch which I used as little as possible. Looping, turn off the petrol by the big plug cock upon the panel just before the bottom of the dive, ease the stick gently back and over you go. The engine dies at the top of the loop; ease the stick fully back and turn the petrol on again as the ground appears so that the engine comes to life five or six seconds later."

Refreshing stuff, in these days of powered controls and unpiloted missiles. H. W.

Vistas In Astronautics. Edited by Morton Alperin, Marvin Stern and Dr. Harold Wooster. Pergamon Press Ltd., 4-5 Fitzroy Square, London, W.1. Price £5 5s. Illustrated.

STATED to be the first technical meeting of its kind in the U.S.A., the astronautics symposium at which the papers reprinted in this volume were presented was convened at San Diego in February 1957. Co-sponsored by the Air Force Office of Scientific Research of Air Research and Development Command, and Convair Division of General Dynamics Corporation, the meeting had two objectives: to survey the scientific and technological progress of astronautics, and to indicate the lines of research to be emphasized to facilitate future space exploration.

The total of 43 papers are divided into the following main categories: re-entry; tracking and communications; environment and measurements; population; orbits; and human factors. This last section deals mainly with medical aspects but includes a legal contribution, *Current International Situation and the Legal Involvements with respect to Long-range Missiles and Earth-circling Objects*, by Andrew G. Haley.

Into Thin Air, by E. W. Still, Ph.D., B.Sc., A.C.G.I., A.M.I.Mech.E., F.R.Ae.S. Normalair, Ltd., Yeovil. Price 18s 6d. Illustrated.

CERTAIN to be regarded for many years as a valuable standard work on its subject, this book on aircraft air conditioning systems has been written by Dr. E. W. Still, technical director of Normalair, Ltd., and published by the company.

Twelve chapters variously cover physiological factors of high-altitude flight, general requirements of air conditioning, pressure-control systems, power and air supplies, cooling and heating, temperature and humidity control, airflow and ventilation, oxygen systems, mountaineering oxygen equipment, testing of systems and components, and official requirements. Seven appendices include sample calculations for the air conditioning of a 100-seat jet airliner, and I.C.A.N. standard atmosphere tables and data for altitudes between −1,500ft and 100,000ft.

While this list gives some indication of the extent of the field covered, it cannot reflect Dr. Still's approach, which is an extraordinarily informative one. He discusses current theory and practice in concise style free from those conventional affectations which so often mar the work of scientific workers; and his 215 pages (5¼in × 8¼in) are very thoroughly illustrated by photographs and line diagrams well reproduced on art paper.

Man Among the Stars, by Wolfgang D. Müller. George G. Harrap and Co., Ltd., 182 High Holborn, London, W.C.1. Price 18s. Illustrated.

THIS is quite a low-powered book on a high-powered subject, and takes us no further than similar works published in the last year or so. But it does approach the science of future space travel in an easy manner, although many of the points mentioned are of only academic interest and the details discussed are necessarily unsubstantiated. Mr. Müller discusses religion in space—saying that the willingness of theologians today to philosophize about space "must tend to expand space consciousness of the Christian world"—and considers the question of life on other planets and interplanetary law. It is under this last heading that we must consider who really owns the space we have not yet been to—or should that come under religion? A. C. B.

OTHER BOOKS RECEIVED

Science and Fiction, by Patrick Moore. George G. Harrap and Co., Ltd., 182 High Holborn, London, W.C.1. Price 10s 6d.

Turbojet Fundamentals (2nd edition), by H. E. Morgan. McGraw-Hill Publishing Co., Ltd., 95 Farringdon Street, London, E.C.4. Price 23s 6d.

The Fastest Man Alive, by Lt-Col. Frank K. Everest, Jr., as told to John Guenther. Cassell and Co., Ltd., 35 Red Lion Square, London. W.C.1. Price 21s.

Atlantic Adventure, by Basil Clarke. Allan Wingate (Publishers), Ltd., 12 Beauchamp Place, London, S.W.3. Price 21s.

The Zero Fighter, by Jiro Horikoshi and Masatake Okumiya with Martin Caidin. Cassell and Co., Ltd., 35 Red Lion Square, London, W.C.1. Price 30s.

The Springs of Adventure, by Wilfrid Noyce. John Murray (Publishers), Ltd., 50 Albemarle Street, London, W.1. Price 18s.

"The Aeroplane" Directory of British Aviation, 1958. Compiled by the staff of *The Aeroplane*. Temple Press, Ltd., Bowling Green Lane, London, E.C.1. Price 30s.

The Challenge, by Harold Mansfield. Allan Wingate (Publishers), Ltd., 12 Beauchamp Place, London, S.W.3. Price 21s.

The Wandering Albatross, by William Jameson. Rupert Hart-Davis, Ltd., Soho Square, London, W.1. Price 16s.

Down in the Drink, by Ralph Barker. Pan Books, Ltd., 8 Headfort Place, London, S.W.1. Price 2s 6d.

Natural Aerodynamics, by R. S. Scorer. Pergamon Press, Ltd., 4 & 5 Fitzroy Square, London, W.1. Price 60s.

Aerodynamics of Supersonic Flight (2nd edition), by Allan Pope. Sir Isaac Pitman and Sons, Ltd., Pitman House, Parker Street, Kingsway, London, W.C.2. Price 35s.

Aircraft of the Royal Air Force 1918-58 (revised edition), by Owen Thetford. Putnam and Co., Ltd., 42 Great Russell Street, London, W.C.1. Price 50s.

War in the Air (revised edition), by Gerald Bowman. Pan Books, Ltd., 8 Headfort Place, London, S.W.1. Price 2s 6d.

Flying Matilda, by Norman Ellison. Angus and Robertson, Ltd., 105 Great Russell Street, London, W.C.1. Price 25s.

The Hollow Square, by Geoff Taylor. Peter Davies, Ltd., 38 Bedford Square, London, W.C.1. Price 15s.

Johnson's Journey, by W. D. Pereira. Robert Hale, Ltd., 63 Old Brompton Road, London, S.W.7. Price 10s 6d.

Smugglers of the Skies (*Hunter Hawk—Skyway Detective No. 3*), by Eric Leyland and T. E. Scott-Chard. Edmund Ward (Publishers), Ltd., 194-200 Bishopsgate, London, E.C.2. Price 7s 6d.

AIRPORT LIFEBOATS

POWERED, inflatable, rubber Zodiac boats, made by R.F.D., Ltd., and mounted on light trailers, are to be stationed as mobile rescue units at Speke Airport—which is situated alongside the Mersey near Liverpool—for use in case of an aircraft crash in water. One unit is already established at Bahrein and another is to be based in the Hebrides. Trailer and boat are run into the water together and the boat floats clear to take rescue equipment to the scene of the accident. Zodiacs can maintain over 24 kt.

The boat is carried, already inflated, resting on wooden runners on the trailer. For launching, the retaining ropes are unfastened so that the craft floats free when the trailer enters the water. The crew, being already on board, start the outboard engine and get under way. Mast, oars, searchlight and inflatable life-rafts are carried for use during rescue work.

A demonstration launching on Queen Mary reservoir, near Staines.

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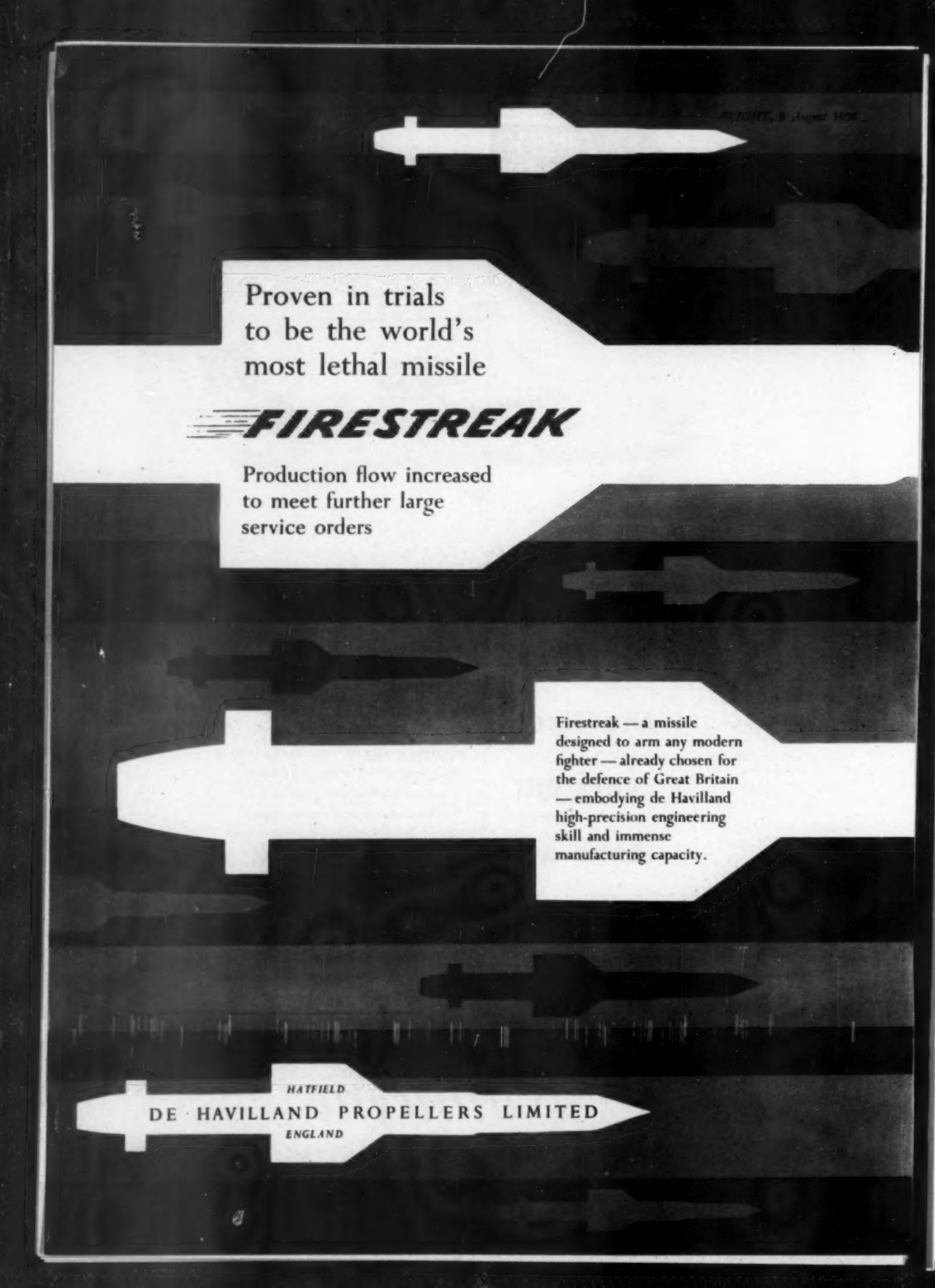
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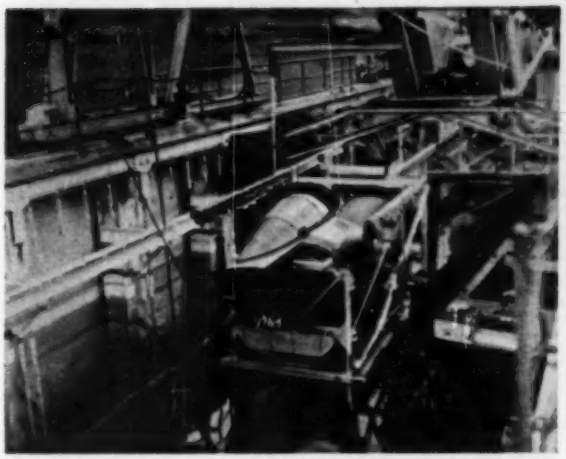
Underwater Ejection

INVESTIGATING METHODS OF ESCAPE FROM SUBMERGED AIRCRAFT

THIS article, reprinted (with minor amendments) from "Royal Naval Diving Magazine" by courtesy of its editor (CPO R. L. Benfield) and permission of the Admiralty, gives a factual account of a series of practical investigations into methods of escape from submerged aircraft —in particular, use of the ejection seat in aiding such escapes. Sometimes as a result of official secrecy, but often because of the reticence and modesty of the participants, hazardous experiments of this kind go unpublicized. "Flight" counts it an honour to be able to bring this remarkable story to a wider circle of readers. Its author is Surg. Lt-Cdr. J. S. P. Rawlins, M.B.E., R.N., who was responsible for the inception and direction of the trials.



The Sea Vixen fuselage section in the tank at Glenfruin. The navigator's hatch can be seen on the right, alongside the pilot's canopy.

WITH the recent influx of advanced jet aircraft types into the Fleet Air Arm new problems in the safety of the crews have arisen. These involve not only flying and carrier-landing questions, but also those of escape from the aircraft in the event of a crash during take-off.

Hitherto, most aircraft have shown a tendency to float for a period of time sufficient to afford the crew a reasonable chance of getting out, although there are few, if any, records of successful escapes from aircraft which have entered the water upside-down. But the present generation of Naval aircraft have drastically altered the picture, for whereas it was formerly the practice to take-off and land with the cockpit hoods open, aerodynamic considerations preclude this in modern jets and, as the all-up weight has increased to more than twice that of a London bus, the aircraft will usually sink far more quickly than did earlier types.

In the Sea Vixen, the observer has to crouch more or less at the pilot's feet with only a small rectangular window in the side of the fuselage to give him a view of the outside world and is sealed-in by a massive 40lb hatch of metal and Perspex which is stamped down into position over his head by one of the flight-deck crew prior to take-off. It was in relation to this aircraft that the Institute of Aviation Medicine was first asked to co-operate in an investigation into problems of underwater escape. This was an unusual assignment for an organization specializing in problems of flight, yet logical because the Institute is an authority on ejection and had already put forward proposals for using the ejection seat as a means of escaping from submerged aircraft. This trial was regarded as a preliminary to a more ambitious programme.

The trials team comprised two doctors from the Institute and a clearance-diving team—Lt-Cdr. Terrell, L/Sea Robbies and A/LSea Rowe; the trial was conducted at the Admiralty Hydroballistics Research Establishment, Glenfruin, with the co-operation of the staff there and of representatives of the de Havilland Aircraft Co. A section of Vixen fuselage, incorporating both pilot's and observer's compartments, was mounted in a metal frame with 7,000 lb ballast. This was suspended from a hoist which could lower it into the test tank at a maximum speed of 0.8ft/sec.

Preliminary tests were carried out to assess the chances of the walls of the cockpit collapsing from the pressure of water, and when it was apparent that this was unlikely to happen the three divers and one of the doctors took it in turns to descend to various depths and try to jettison the canopies and escape. Pattern 5562A breathing apparatus was worn on all but the last test (in which the subject wore a standard aircraft oxygen mask and made a free ascent to the surface), and a waterproof intercom system permitted the divers in the fuselage to keep in touch with the surface and call out the depth of water within the cockpit as the sinking fuselage flooded up.

It was found that the canopy could not be jettisoned until the cabin was about half-full of water and the pressure difference between the trapped air and the surrounding water was not more than 2½ lb/sq in. At this stage, the jettison-system would blow off the canopy with a loud bang, and for a brief period the diver would be subjected to a severe buffeting from the inrushing water. As soon as this ceased he could release his seat harness, kick himself free of the cockpit, and surface.

From these trials it was concluded that the chances of escape from a Vixen submerged in the normal attitude were good; but if the aircraft was inverted the essential flooding-up process would cause the pilot's head to be submerged first and his chances of escape against the inrush of water would accordingly decrease. It was also demonstrated that it was fatally easy to become snagged by the multitude of equipment which the aviator has to carry, and the difficulties of sorting this out, with little or no visibility, while being dragged down by a sinking aircraft can well be imagined. For this reason it was decided to investigate the use of the ejection seat under water as this offered a means of carrying the pilot clear of the wreckage, and the automatic release system would then separate him from the seat and allow him to float unimpeded to the surface.

It was not really anticipated at the outset that there would be much future in using the seat with the existing explosive charge for, although Lt. McFarlane, R.N., had actually escaped under water by firing his ejection seat, there was no means of telling how many others had tried it and failed. However, the first step was to fire a seat and see what happened.

This was carried out in a tank at Farnborough with various types of seat and a 150 lb dummy subject and the following facts were established:—

(1) Acceleration of the seat, 160ft/sec/sec.
(2) Maximum velocity achieved, 34ft/sec.
(3) Blast pressure from ejection cartridge, 26 lb/sq in.
(4) Maximum height of rise of seat, 19ft.

Could a man withstand the combined effect of the drag resulting from acceleration and velocities higher than had ever voluntarily been experienced under water before, and of the shock-wave acting on his head and chest as he was shot up through a pressure change of over half an atmosphere?

It was decided to tackle the question of velocity first. On Horsea Island a metal and wire trapeze was constructed and attached via a float and a single sheave to a 2.4 litre Jaguar car. The subjects took it in turns to lie on the bottom of the lake braced between the two bars of the trapeze. Having breathed out to avoid the danger of lung-rupture during his sleigh-ride towards the surface, each gave the signal to go. The Jaguar accelerated along the bank from a racing start, pulling the trapeze up from the bottom at a shallow angle and then horizontally across the lake at about 10ft below the surface; a maximum speed of 44ft/sec was achieved in this way. Velocity itself was no problem.

Acceleration and blast pressure were then tackled together by actual ejections, using reduced charges, in the tank at Farnborough. Lt-Cdr. Terrell and L/Sea Cannon were called in to assist. As there was no hoist available the seat was mounted on a frame at the bottom of the empty tank. The subject, wearing a two-way stretch and D.S.E.A., was strapped in. With Lt-Cdr. Terrell standing by as underwater attendant, the tank was filled up with cold, murky water. As soon as a depth of 15ft above the subject's head was reached, the recorders were switched on, the subject pulled the ejection-blind over his face, spat out his mouthpiece and breathed out hard into the water, and the signal to fire was given. Five seconds later the seat was fired by remote control and the next moment seat and occupant were being lifted out into the sunshine.

The first test, with 350 gr cordite, although a somewhat exhilarating experience, was a complete success; and the next test, with 650 gr, took place a few days later. Exactly the same routine was followed but this time the kick of the ejection seat was much more marked—probably because the subject was not strapped in sufficiently tightly; and both subject and attendant were considerably shaken by the double thump of the explosion and its reflected wave from the sides of the tank. It was decided that future tests must take place in a larger tank, where good visibility would

Seat and dummy subject in the tank at Farnborough in readiness for the first submerged-ejection tests. Live tests were later made.

UNDERWATER EJECTION . . .

permit full photographic coverage of anything which might occur. Accordingly a move was made once more to Glenfruin.

By this time two more doctors had qualified as shallow-water divers and the new diving-team from *Vernon* arrived: PO Christmas, L/Sea Davis, AB Stanswick, AB Le-Cornu and AB W. Smith.

Supported up to the hilt by the Royal Air Force at Farnborough, who provided aircraft ranging from Devons to 600 m.p.h. Canberras to bring up spare seats and equipment and take back relays of divers and doctors for week-end leave, the trial entered upon its most enjoyable phase.

Initially, further tests were carried out to check the Glenfruin recording gear and to make certain that the tank's glass windows would withstand the shock-wave, for the hydrostatic pressure on the lowest panes was in any case some 10,000 lb, implying that a breakage would have a disastrous effect on personnel both inside and outside the tank. For this reason only the controlling officer who was directly responsible for the safety of the diver remained at the window, all cameras and recording-gear being operated by remote control and the technical staff and officer-in-charge of test being linked to the controller by means of an intercom system.

The routine employed for a live test was as follows. The subject, wearing a suit and cut-down S.W.B.A., was strapped tightly into the seat, which was mounted on an A-frame slung from the hoist. One diver acting as underwater attendant, and two stand-by divers, entered the water as the seat was swung out and lowered. There the stand-by divers unhooked the straps from the hoist, connected the firing cable, and retired towards the surface—one being responsible for the subject, the other for his attendant. The latter removed the safety-pins from the seat, showed them to the controlling officer at the window, and retired to the wall near the subject; there he anchored himself by a loop of rope. The controller checked in turn with the recorders, photographers and the officer in charge of test at the tank top and signalled by five flashes of a floodlamp to the subject and his attendant. The subject pulled the face-blind over his face, breathed out and gave a thumbs-up to the attendant. The latter, if he was satisfied that all was still well with his subject, gave the signal to fire, which was transmitted over the intercom system by the controller to the officer in charge. With a five-second count-down to allow the cameras, recorders and timing mechanism to start up and the flares to be ignited, the seat was fired.

In the event of a misfire or hang-fire the attendant would go at once to the subject, warn him with a tap on the shoulder not to start breathing, and insert the first safety-pin. This took five to seven seconds. He then tapped the subject again to signify that he could start breathing shallowly and screwed home the second pin. Seat and subject were then hoisted out.

The reason for the breathing routine was that, no recompression chamber being immediately available, it was essential to eliminate all risk of a ruptured lung during the ride to the surface at over 20 m.p.h.

This system of diving worked perfectly throughout, and five further live tests were subsequently completed, including two by PO Christmas and one with the 1,500 gr full charge. Since then a further eight have been made, including full-charge shots with the more powerful telescopic gun. No serious damage resulted from any of the shots and, although no one would recommend riding the ejection seat under water as a form of sport, there is no doubt that use of the seat is an acceptable method of underwater escape.

In addition, a number of tests have been made of firing dummies through the Perspex canopy of a Sea Hawk fuselage, and it is concluded that the best way of getting out of a cockpit with a breakable canopy when under water is to fire the seat through it.

The investigation was a joint effort by the Navy, the Royal Air Force and the M.o.S., and it would be impossible to acknowledge all those who played a part. Much of the credit, however, belongs to the two diving teams mentioned and to their colleagues who subsequently replaced them. Not only did they act as subjects in some of the tests as well as being responsible for the safety of the other subjects but, in addition, they spring-cleaned the tank and its windows, assembled equipment under water, acted as assistant engineers, electricians and photographers and generally maintained the morale of the Establishment.

It is hoped that in the amenities of Glenfruin and in the hospitality of the natives they found adequate recompense for their labour!

Other divers who took part in these trials were: PO Ronald Flanagan, L/Sea R. Davies, L/Sea J. Hendrick, L/Sea Harrison, AB F. Newman, AB H. McLean, AB D. Vaughan and AB E. Horricks.

CANADIAN BUYERS' BAEDEKER

IN his foreword to the *CABMA Register 1958-59 of British Industrial Products for Canada* the chairman of the Dollar Exports Council, Sir William Rootes, says that although British exports to Canada last year were a record ($550m) this was only 9 per cent of Canada's total imports. Before the war our share was 17.6 per cent and it was essential for us to get back our pre-war share, then exceed it. To do this it was necessary to let our Canadian customers know that we had the goods they needed, and the names of the firms—and their Canadian representatives and distributors—who were able to supply their requirements. That was why the Council welcomed the *CABMA Register*, now entering its sixth edition.

All the information contained in previous editions has been brought up to date; the buyers' guide lists alphabetically some 3,200 British products available to the Canadian market, with their suppliers given under each heading (French equivalents of these headings being set out alphabetically in a separate glossary); a directory of nearly 4,000 British firms gives details of their distribution arrangements in Canada, and further information about some of these firms and their products is given in another section.

The *CABMA Register 1958-59* is published jointly by Kelly's Directories, Ltd., and Iliffe and Sons, Ltd., for the Canadian Association of British Manufacturers and Agencies (managers of the British Trade Centres in Toronto, Vancouver and Montreal). It contains 656 pages and the price is 15s, post free.

FORTHCOMING EVENTS

Aug. 1-16. Czech Aero Club: World Parachute Championship, Bratislava.
Aug. 9. R.N. Air Stations Yeovilton, Somerset, and Lee-on-Solent, near Fareham: At Homes.
Aug. 16-17. Alsace Aero Club: Rally des Vins, Alsace.
Aug. 31. Oxford Aeroplane Club: At Home, Oxford Airport.
Sept. 1-7. S.B.A.C. Display and Exhibition, Farnborough.
Sept. 4-6. AGARD Avionics Panel Meeting, Cambridge.
Sept. 8-13. International Congress of Aeronautical Sciences, Madrid.
Sept. 21. B.G.A.: National Sailplane Aerobatic Contest, Dunstable.
Sept. 21. Royal Belgian Aero Club: 900 cu m Balloon Competition.
Sept. 21. Milan Aero Club: Rally.
Sept. 26-29. Austrian Aero Club: Innsbruck Rally.
Oct. 20-29. AGARD Meetings, Copenhagen.

Veteran Constellations

By DENNIS M. POWELL

L.49 F-BAZB (photographed here in June 1946) was sold to T.W.A. in 1949. Now N9410H "Star of London," it has logged over 32,000 hr.

IN an article entitled "Across Three Oceans" (August 6, 1954), the Editor-in-Chief of *Flight* said, "I always enjoy the feel of a Constellation take-off because it roars and surges forward as eagerly as a racing car." The present writer has his own special personal affection in regard to the earlier Constellation Series, because these aircraft really pioneered completely new landplane standards in long-range over-ocean flight schedules with so many of the world's major carriers that operated them. For more than a decade, the Constellation has widely distinguished itself, having brought great international prestige to both its builders and its operators. When one pauses to reflect that the original "Connie" was designed in 1939-40 and made its first flight in January 1943, it can fairly be classified as a truly outstanding aeronautical engineering achievement in airliner design.

January 9 of this year marked the fifteenth anniversary of the original L.49 Constellation prototype's first flight at Burbank, California, in the hands of the late Edmund T. (Eddie) Allen, and the late Milo Burcham. (These men were two of America's best known and greatly experienced test pilots until their untimely deaths in 1943 and 1944 respectively, both whilst testing different types of aircraft. Actually, Allen, who was Boeing's chief test pilot, was on loan to Lockheed's for a short spell early in 1943, whilst Burcham remained Lockheed's C.T.P. until he was killed whilst testing the second P-80 Shooting Star prototype in July 1944.) For the record, the L.49 prototype was originally registered NX25800, but when officially taken over by U.S.A.A.F. on July 28, 1943, it became 43-10309. Shortly after VJ-day it was acquired by Howard Hughes from the U.S. War Assets Administration (at, I understand, a mere $40,000 without C. of A.), and then became NX6700. From 1945 to 1949 the famous prototype flew less than 100 hours, in the hands of Hughes and other pilots employed by him. Early in 1950, Hughes sold it back to Lockheeds. They took it apart and rebuilt it to become the original L.1049 Super Connie prototype, in which "re-design" form it made its first flight on October 13, 1950, being re-registered NX67900. It was flown by Jim White and Ray Meskimen, two of Lockheed's oldest test pilots.

The constructor's serial number has always remained the same —1961—and, for a good many years the aircraft has affectionately been known to many Lockheed employees as "Old 1961," or sometimes "The Beast of Burbank." Without a doubt, this aeroplane has probably had one of the most remarkably fantastic careers of any prototype ever built. It has probably contributed more to the ultimate international fame of the Constellation series than any other technical aspect in the continuous development "stretching process" of the whole Constellation/Super-Connie series.

Over the past few years numerous issues of *Flight* have duly recorded, in meticulous detail, practically all the continuous technical developments in all series of the Constellation. In the present article, therefore, it may be of interest to set down some brief individual histories of some of the oldest "un-stretched" Connies, all of which are still very much in active service with their current owners. These earlier Constellations continue to amass a combined total of several hundred thousand airframe hours on about two-thirds of the world's main long-distance routes, despite the advent of the newer L.1049 and L.1649 series.

Speaking of numbers, there are currently flying 67 of the L.49/149 series, plus a total of 117 of the later L.649/749/749A series. More than two-thirds of individual machines in these impressive totals have logged up to something like 20,000-25,000 airframe hours apiece, whilst a much smaller percentage of the remainder have exceeded this figure by substantial margins, going up to around the 35,000 hours per airframe (as at January 1958).

The original T.W.A. specifications which resulted in the L.49 basic design were given to Lockheed in June 1939, but it should not be forgotten that the true forerunner of the Constellation was actually Lockheed's L.44 Excalibur project which was announced in April of the same year. This was envisaged as a four-engined pressurized landplane (for Pan-American) with a gross weight of 27,550 to 36,000 lb and carrying 21 to 26 passengers. In striking contrast, although Lockheed's first conceived the Connie as a 59,200 lb aircraft, this figure was rapidly increased to 72,000 lb then to 77,050 lb and finally to 86,250 lb (seven tons more than the original design) by the time the prototype was completed and first flown in January 1943. Thus, both in design and performance, even the "finalized" L.49 Constellation layout was not a timid, evolutionary step forward in airliner design. It was a bold and revolutionary advance, even compared with the original Douglas DC-4 of 1937-8.

Today T.W.A., the original sponsors of the Constellation (their first L.49s went into service in February 1946), still remain the world's biggest operators of *all* the Connie family. Their huge fleet includes thirty-two of the oldest L.49s, thirty-nine L.749s plus thirty-one L.1049s, and finally twenty-nine of the latest L.1649As known as "Jetstream Starliners." About twenty of T.W.A.'s oldest L.49s are (not surprisingly) carrying on their many years of service as staunch money-makers on the carrier's coach-class domestic flights.

All such L.49s are fitted as 81-seaters. Other L.49s (and some 749s) are fitted as 57-seaters on the line's first-class domestic flights. The remaining 749s and 749As are employed on T.W.A.'s international schedules between the U.S.A. and the Middle/Far East. Passenger-cabin configurations on these schedules range from the all-sleeper 18 berths on some of the de-luxe "Ambassador" Atlantic schedules to 61-seaters on the large numbers of Tourist overseas flights operated by these aircraft.

T.W.A.'s oldest L.49s include N90830 (CN.1969 ex-U.S.A.F. C-69, serial 10317); N90831 (CN.1970 ex 42-94549); N54214 (CN.1974 ex 42-94553); N86500 (CN.2021 ex 42-94560); and finally, N86501 (CN.2022 ex 42-94561). All these L.49s have logged over 30,000 hours apiece in eleven years of continuous service.

Pan-American have long ceased to be regular Connie operators. Their last four L.49s (actually two 49s and two 149s) were sold to Delta Airlines in 1956-57. These aircraft were N90923 (CN.2053), N90925 (CN.2063), N88855 (CN.2055) and N88868 (CN.2067), all of which are currently flying as 72-seaters on Delta's coach-class domestic schedules. It is, nevertheless, worthy of record that P.A.A.'s inaugural eastbound Atlantic flight, on February 11, 1946 (La Guardia to Hurn non-stop), was made by N.88833, *Clipper Bald Eagle*, commanded by Captain R. W. Fordyce with 29 passengers aboard. It was actually the first commercial Constellation to be seen in the U.K. This same Connie is still flying with Panair do Brasil as PP-PDD (CN.2033). Six of the ten L.49s currently in use by this major Brazilian carrier are all ex-P.A.A.'s original fleet of seventeen L.49s. To be precise, the Brazilian Line's current fleet of much-used Connies consists of six 49s and four 149s. A new lease of life (seven to ten years) is confidently predicted for these early Constellations if the proposed deal with Napier to re-engine the whole Panair fleet with Eland turboprops materializes.

Other ex-P.A.A. Connies still flying include four 749s N86527 to N86530 inclusive. Sold to Air France in 1951, they are currently flying as F-BAZU, -ZV, -ZX, and -ZY. Incidentally, F-BAZY

A 1948 picture of P.A.A.'s L.749 NC.86520, originally "Clipper America." Sold to Air France in 1950, it became F-BAZY. The aircraft has flown some 24,000 hr in nine years.

Eastern's first L.649, N101A, with Speedpak—the first production Connie to be so fitted. It has logged about 35,000 hr and is still with Eastern Airlines.

VETERAN CONSTELLATIONS . . .

-DI, -DE, -DD, -DG, -DC and -DB. In 1953 they were sold to Capital Airlines, becoming N90608, N90624, N90623, N90625, N90621, N90607 and, lastly, N90622 (these American registrations are as they were allocated to each ex-K.L.M. machine in the order listed above).

Remaining B.O.A.C. 749s which have had *two* previous owners are G-ANTF and G-ANTG. Originally, back in 1948, they were Air-India International's VT-CQS and VT-CQR. In 1951 they were sold to Qantas, becoming VH-EAF and VH-EAE respectively (see *Flight*, January 27, 1956, p. 106). They were sold to B.O.A.C., together with VH-EAA and -AB, in July 1954.

Of the Corporation's remaining 749 fleet, G-ANNT is ex-T.W.A.'s N6025C, and G-ALAK, -AL, -AN and -AO were formerly Aerlite Eireann's EI-ACR, -CS, -DD and -DE respectively. For the record, B.O.A.C. acquired these ex-Irish Connies in June 1948, so they have practically completed ten years of unbroken service with the Corporation. The one remaining ex-Irish Connie, EI-ADA (which became G-ALAM) was, sad to relate, written off as a result of a tragic crash at Singapore on March 13, 1954. Three of B.O.A.C.'s fleet of sixteen 749s were sold in 1957 to U.S. buyers, whilst of the thirteen remaining, eight are still in service, with five "cocooned" at London Airport, awaiting sale.

Mention should be made of Eastern Airlines' big Connie fleet, which includes eighteen L.649s, originally delivered in 1947-48, plus ten L.1049Gs, sixteen L.1049Cs, and thirteen L.1049s—making them the second largest operators in the world of these types. Utilization of the combined Eastern fleet averages 11¼ hr daily: probably the highest in the world for the Constellation series.

With the exception of the DC-4 Skymaster, no other four-

(Above) A 1947 study of Panair do Brasil's L.49 PP-PCF. Still in service, it had amassed 29,600 hr up to August 1957.

(Right) L.749 VT-CQS has had four owners: Air-India, Qantas, B.O.A.C., Transocean Airlines (to whom it was sold by B.O.A.C. in 1957). Hours to August 1957, 23,000.

seems to have led a charmed life. Back in January 1949, when it was flying as N86530 *Clipper Monarch of the Skies*, it survived a truly miraculous mid-air collision with a Cessna 170 shortly after taking-off from New York *en route* to London. A huge hole, about 15ft in length, was torn in the forward upper part of the fuselage. Thanks to the superb airmanship of the skipper and the co-pilot, the Connie made a safe landing at the U.S.A.F. base, Mitchell Field (N.Y. State) without injury to any of the 29 persons aboard.

Again, on the subject of changes of ownership, the following is a small selection taken at random. Pan American's former L.49s which are now flying with Panair do Brasil include: PP-PCB (N88848), PP-PCF (N88849), PP-PCR (N88860), PP-PDE (N88847), and finally PP-PDG (N88837). Former Air France L.49s now flying on T.W.A.'s domestic coach flights are N9409H (F-BAZA), N9410H (F-BAZB), N9412H (F-BAZC) and N9414H (F-BAZD). Another T.W.A. L.49 is N6000C, which was sold to them in 1950 by K.L.M., having previously been PH-TAW. Other ex-K.L.M. L.49s flying in the U.S.A. are N86531, N86532 and N86533 of Capital Airlines; their former Dutch registrations were PH-TAU, PH-TAV and PH-TAX.

"Thrice-owned" L.749s include B.O.A.C.'s G-ANVA, -VB, -UX, -UY, -UZ, together with G-ANUV and G-ANUD. Originally, these seven Connies were respectively K.L.M.'s PH-TDH, engined transports have "changed hands" on so many occasions. For example, about 50-odd 49s and 749s have had two owners. Of this total, about half have had three different operators and at least a dozen (and probably more) of these same Connies have flown with four different airlines in eleven years of unbroken service since they were delivered to their original purchasers. Even more remarkable, perhaps, is the fact that whenever these older Connies are put up for sale they are usually eagerly sought by several prospective airline buyers at prices varying from £175,000 to £200,000 each for the oldest L.49s, increasing to about double these figures for L.749s with current Cs. of A.

Of the earlier Connies on the world's most highly competitive route—the North Atlantic—even as recently as mid-1956 there were 46 of the type(s) operated by three major I.A.T.A. carriers (as compared with a total of 20 DC-6s flown by four carriers) in the same westbound summer peak period of operations. At the same time, the Super-Connie series closely rivalled the DC-6B/DC-7B series by a total of 65 to a total of 79 respectively! Other equally impressive Connie/Super-Connie statistics show that the huge total of about 78,000 North Atlantic scheduled flights have been made by all Connie types between February 1946 and December 1957. Both Connies and Super-Connies in world-wide airline schedules have amassed the combined seemingly fabulous total of over one billion miles in eleven years of service.

A 1944 picture of 310313 (C.N. 1965), actually the fourth production L.49/C-69, which flew under T.W.A. colours before being taken over by the U.S.A.A.F. in 1945. Sold in 1948 to A. Schwimmer and acquired by El Al in 1951; still flying, as 4X-AKB, with over 25,000 hours.

A New General-purpose Helicopter Powered by a Free-turbine Engine

SAUNDERS-ROE P.531

Flight trials of G-APNU are proceeding very satisfactorily, and several hours have been logged. Here the tailplane is not fitted.

THE current year will be memorable as one in which the British aircraft industry produced a series of notable turbine-driven helicopters. Smallest of these, but probably the one which will be manufactured in the greatest quantity, is the P.531 by Saunders-Roe, Ltd., whose helicopter division is located at Southampton Airport. The development of this attractive machine has been outstandingly rapid; although detail design started as recently as January 1 of this year, the first prototype has already been flying three weeks.

Saunders-Roe entered the rotary-wing field in 1951, when the company assumed responsibility for the further development of the Cierva Air Horse and Skeeter. The former was abandoned for financial reasons, but the Skeeter is today in full production as a standard light helicopter. This is providing adequate current business; but, looking to the future, it had long been apparent to the company that there would be a demand for a new general-purpose helicopter with much better characteristics than any hitherto produced. The use of a turbine power unit would greatly increase the payload and performance of a helicopter of a given size, and at the same time the company appreciated the possibility of evolving a machine with outstanding reliability and ease of servicing.

In the summer of 1957 the Blackburn Turmo free-turbine engine was awarded a special-category type-test certificate, and this powerplant seemed an obvious basis around which to plan the new helicopter. Saro have never had strong views on the question of free-turbine versus single-shaft engines, but their inclination towards the former is being steadily strengthened by their experience with an engine of this type. The simplest solution would have been to install a Turmo in a Skeeter and keep engineering changes to the minimum, but from the outset it was evident that it would be greatly preferable to start from scratch with a new design. At the same time, however, Saro were careful not only to adhere to proven principles but also to incorporate parts identical with, or based upon, the corresponding parts of the Skeeter wherever this could be done without compromising the new design. In practice this philosophy has been followed to a marked degree and has proven eminently successful.

Serious design started last November. The production machine, designated P.531 Mk 1, will be a five-seater, scarcely larger than the Skeeter in overall dimensions and having rotors of the same diameter, but with tail-rotor blades of increased solidity and a main rotor with four blades instead of three. The transmission and rotor system will be stressed for 650 s.h.p., and it is expected that the powerplant will be a fully rated Turmo of 425 s.h.p. Later a more powerful unit may be fitted, as noted at the end of this article. Meanwhile, construction has proceeded upon two prototypes, virtually identical in appearance but employing a transmission initially limited to 300 s.h.p. and a correspondingly derated Turmo.

These two prototypes have enabled the difficult parts of the design to be investigated much more rapidly than would otherwise have been the case. Engine-handling, vibration, flying controls and several other critical factors are all on the agenda confronting the first prototype G-APNU. It is appropriate now to describe the existing two prototypes before once more picking up the thread of development and future sales.

Structurally the P.531 is extraordinarily simple; and yet a very great deal of care has been taken to ensure the fitness of the airframe for its multitudinous tasks. A sketch on p. 201 clarifies the location of the main load-carrying members, and emphasizes the fact that almost all the visible parts of the forward fuselage are secondary structure which can be cut away with impunity to provide access to the interior.

Nearly the whole airframe is conventionally riveted from light gauge aluminium-alloy sheet. The only significant departures are the employment of thin stainless-steel to form a box under the powerplant, steel tubes to suspend the aircraft from the main rotor and the use of honeycomb in the ventral fin. The fuselage is divided into a forward portion and a rear boom of circular section carrying the tailplane and tail rotor. The forward section is built up on a pair of vertical webs placed side-by-side to form a box-like keel or spinal girder which at the rear is extended upwards to meet the four tubes which suspend the helicopter from the main rotor. The basic structure is completed by the addition of light bulkheads, a metal floor and the fire-resistant sheet-steel tray on which the engine is mounted. In a typical configuration two individual seats are attached to the forward part of the floor and a folding bench seat or stretcher racks can be pinned at the rear. Flying controls pass along the starboard side beneath the floor and up through a trunk on the starboard face of the upturned part of the right-hand main web, to emerge adjacent to the right-hand side of the rotor hub. The electrics similarly pass down the port side, both sides of the fuselage being liberally provided with access doors.

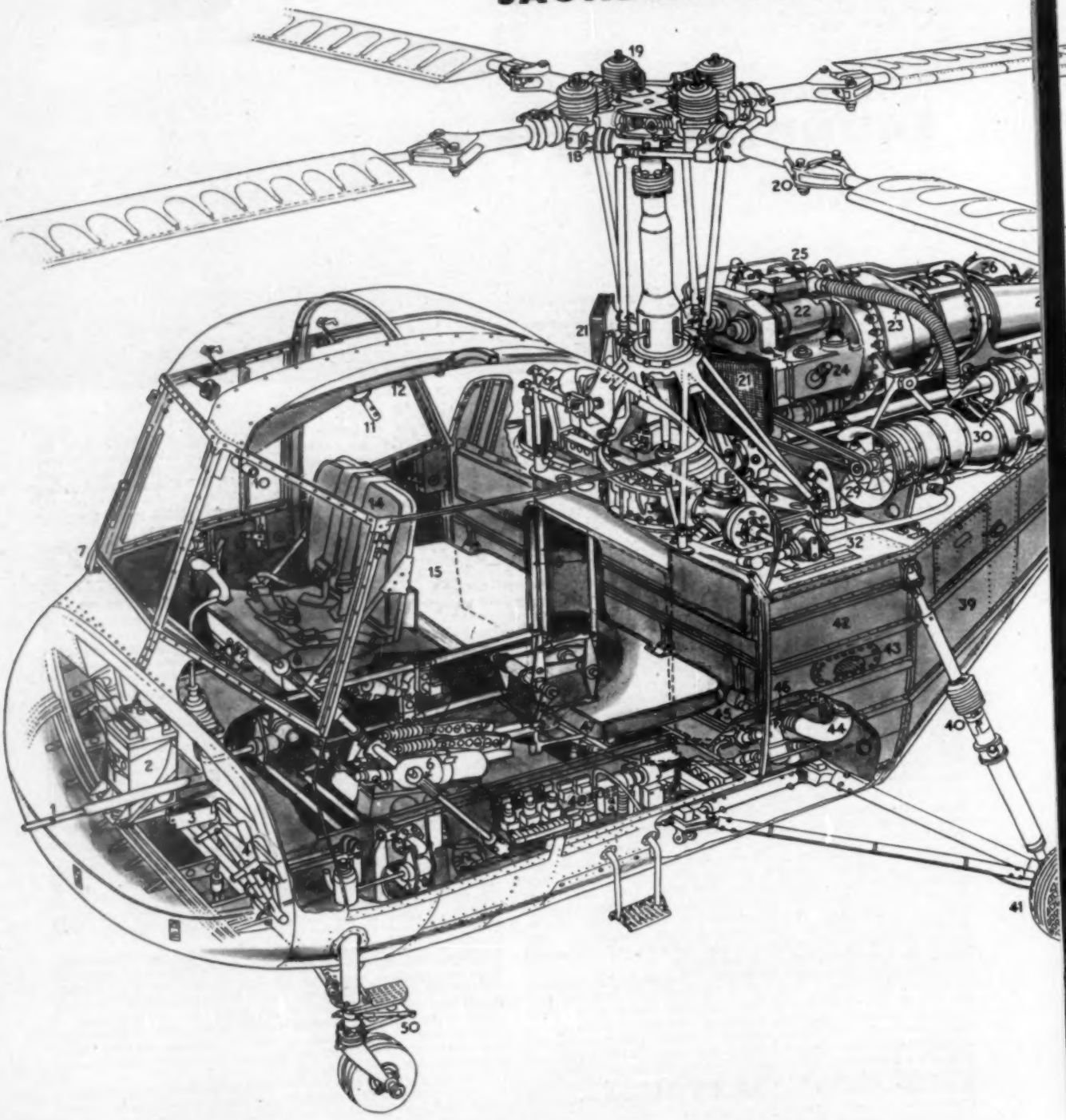
The upturned parts of the main webs locate a pair of transverse bulkheads running the full cross-section of the fuselage. Between these bulkheads is housed all the fuel, there being three flexible cells by Fireproof Tanks, Ltd., joined to a common sump beneath the centre cell. Subdivision of the space into three portions is expected to minimize surging during rapid rolling manœuvres. Ventral doors provide access to the low-pressure warning transducers and filters beneath the port cell and to the twin booster pumps under the central sump.

Power is provided by a Blackburn-Turboméca Turmo 600 free-turbine unit mounted completely externally on the deck at the rear of the forward fuselage. The entire installation is eminently accessible and the decking around the engine has corrugated reinforcing beneath it to withstand the impact of heavy boots.

(*Continued on page 201*)

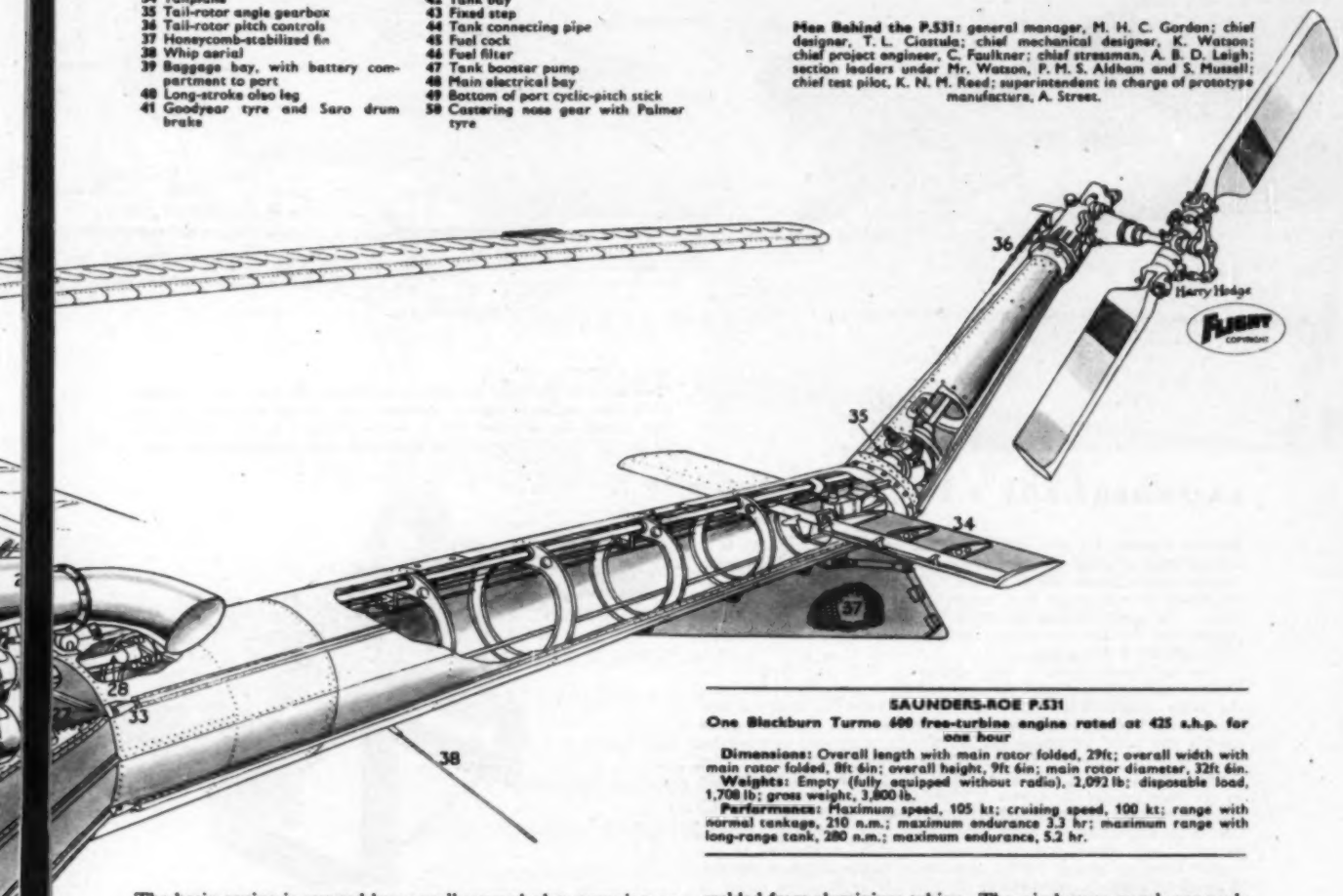
1 Pitot head
2 Radio transmitter/receiver
3 Fuse box
4 Tail-rotor pedals
5 Cyclic-pitch stick (see 49)
6 Collective-pitch twist-grip
7 Windscreen wiper
8 Rotor-brake lever
9 Wheel-brake lever
10 Rotor r.p.m. selector
11 Fuel cock
12 Tailplane incidence controller
13 Door catches
14 First pilot's seat
15 Rear bench seat for three
16 Cyclic-pitch control rods
17 Collective-pitch control rod
18 Blade-spacing snubber
19 Drag-hinge friction dampers
20 Blade root anchorages (withdraw one retention sleeve in order to fold blade)
21 Mesh intake guards
22 D.C. generator
23 Generator cooling air
24 Integral tank for engine oil
25 Fuel control unit
26 Bifurcated exhausts
27 Primary-gearbox attachment
28 Tail-rotor drive
29 Belt-driven fan
30 Twin oil coolers
31 Secondary gearbox
32 Gearbox oil pump
33 Tail-boom attachment and external stiffener

SAUNDERS-ROE P.531



34 Tailplane
35 Tail-rotor angle gearbox
36 Tail-rotor pitch controls
37 Honeycomb-stabilized fin
38 Whip aerial
39 Baggage bay, with battery compartment to port
40 Long-stroke oleo leg
41 Goodyear tyre and Saro drum brake
42 Tank bay
43 Fixed step
44 Tank connecting pipe
45 Fuel cock
46 Fuel filter
47 Tank booster pump
48 Main electrical bay
49 Bottom of port cyclic-pitch stick
50 Castering nose gear with Palmer tyre

Men Behind the P.531: general manager, M. H. C. Gordon; chief designer, T. L. Ciastula; chief mechanical designer, K. Watson; chief project engineer, C. Faulkner; chief stressman, A. B. D. Leigh; section leaders under Mr. Watson, P. M. S. Aldham and S. Mussell; chief test pilot, K. N. M. Reed; superintendent in charge of prototype manufacture, A. Street.



SAUNDERS-ROE P.531

One Blackburn Turmo 600 free-turbine engine rated at 425 s.h.p. for one hour

Dimensions: Overall length with main rotor folded, 29ft; overall width with main rotor folded, 8ft 6in; overall height, 9ft 6in; main rotor diameter, 32ft 6in.
Weights: Empty (fully equipped without radio), 2,092 lb; disposable load, 1,708 lb; gross weight, 3,800 lb.
Performance: Maximum speed, 105 kt; cruising speed, 100 kt; range with normal tankage, 210 n.m.; maximum endurance 3.3 hr; maximum range with long-range tank, 280 n.m.; maximum endurance, 5.2 hr.

The basic engine is secured by a small pressed-plate trunnion on either side, with an additional pair of tight straps providing opposing tangential loads on the underside of the engine to prevent any rotary displacement. The Turmo is fed through lateral intake ducts each facing outwards at about 45 deg and provided with a coarse mesh guard to prevent the ingress of all but the smallest objects.

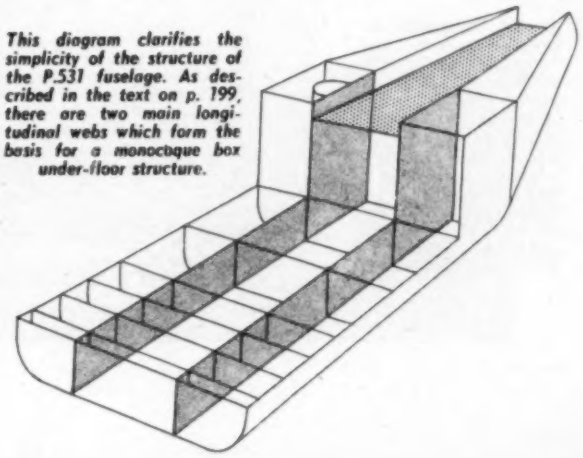
As the free turbine is located at the rear (a cutaway drawing of the engine appeared on p. 757 of our issue of June 3, 1955), the drive is taken through a gearbox and thence forward beneath the engine to the rotor. The gearbox is firmly held down by a pair of 5/16in bolts to resist the considerable torque. The first train comprises simple 5:1 spur-gears. Next come two further spur-gears with a ratio of 27:85, and the output pinion from this box is mounted on a shaft which at the rear drives the tail rotor and at the front is connected to the secondary gearbox via a shaft with a Layrub coupling. The secondary gearbox beneath the rotor houses a crown-wheel and pinion with a ratio of 13:56, giving an overall transmission ratio of approximately 67:1. The secondary gearbox is essentially similar to that used in the Skeeter, although as the drive comes in from the rear instead of from the starboard side the whole unit is turned through 90 deg. A lateral output, which in the Skeeter drove the tail rotor, now serves to drive a Plessey pump which circulates the oil through the secondary gearbox.

A free-wheel is incorporated in the primary gearbox, although the free-turbine powerplant obviates the need for a clutch. A rotor parking brake is incorporated in the shaft leading from the secondary gearbox to the oil pump, although at present this has insufficient capacity to lock the rotor with the Turmo at idling r.p.m. Mounted on the airframe to the left of the engine is the prominent oil-cooler unit. This has a forward-facing intake to an axial fan by the Airscrew Company and Jicwood, Ltd., which is driven by vee-belts from a pulley on the engine. The delivery from this fan is then expelled to the rear through a pair of cylindrical coolers, the lower cooler serving the rear (primary) gearbox and the small upper drum cooling the oil from the secondary gearbox under the rotor. The engine oil is contained in an integral tank around the intake passages and is thus self-cooling.

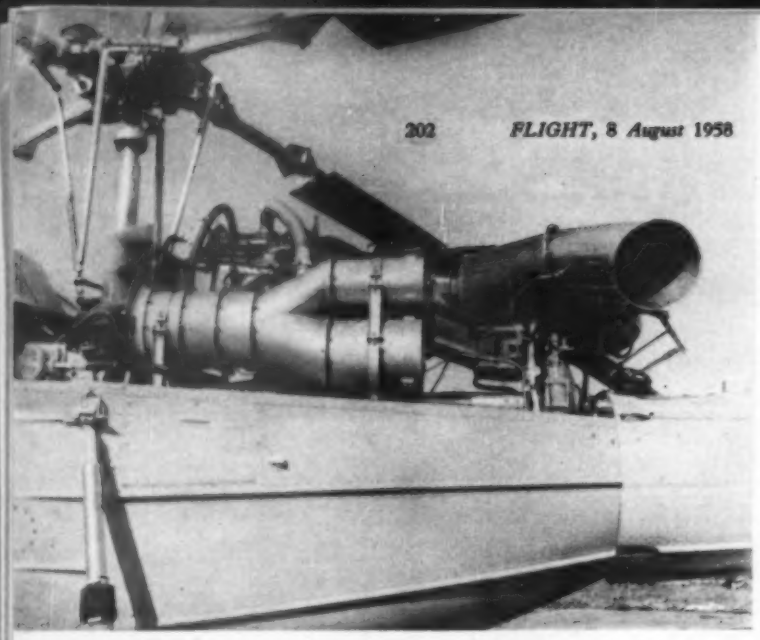
For ease of manufacture and repair, the canopy structure is welded from aluminium tubing. The windscreen panels are made from flat glass, to obtain optimum optical qualities, to facilitate the use of wipers and also so that electrically heated panels can be fitted should this be desirable. Down the centre of the roof is a panel carrying groups of switches and controls; on either side of this panel the roof is formed from a bulged sheet of Perspex to provide adequate head-room (a feature particularly necessary during rescue operations). The sides of the cabin comprise four doors, all hinged at their forward edges. These doors are not stress-bearing, and the aircraft can fly with any or all of them removed.

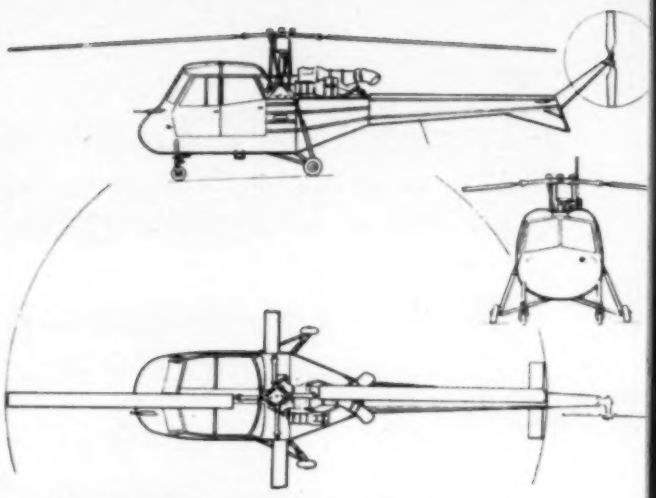
Unlike the Skeeter, the P.531 has four wheels. The main oleos are essentially similar to those used on the Skeeter although they are strengthened and have a longer stroke; each main wheel has a Goodyear treaded tyre and a Saro cable/shoe brake. Each nose unit has a vertical oleo strut carrying a castering wheel fitted with a Palmer high-pressure double-contact tyre. Studies have been made for alternative skid and float undercarriages.

Skinning over the rear part of the forward fuselage is stiffened by external ribs, in order to facilitate manufacture and leave the



This diagram clarifies the simplicity of the structure of the P.531 fuselage. As described in the text on p. 199, there are two main longitudinal webs which form the basis for a monocoque box under-floor structure.





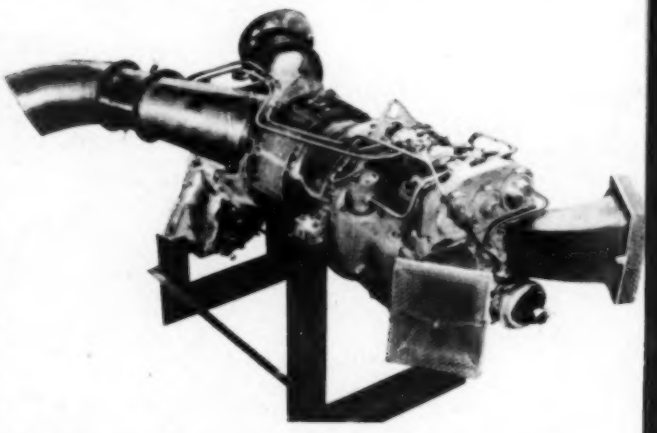
Powerplant of the P.531 is a Blackburn Turmo 600 free-turbine engine. Below, the engine is seen as received from the manufacturer; on the left, above, the installed unit is partly obscured by the twin coolers for the gearbox oil system. The three-view depicts the first prototype.

SAUNDERS-ROE P.531 . . .

interior smooth for the tank cells and equipment. There is a considerable amount of space available in this region, and a large volume immediately ahead of the tail boom attachment face is employed as a baggage bay, access being provided by a ventral door. The main electric battery is fitted on the port side in this region, and further equipment, with appropriate doors, could be incorporated if necessary.

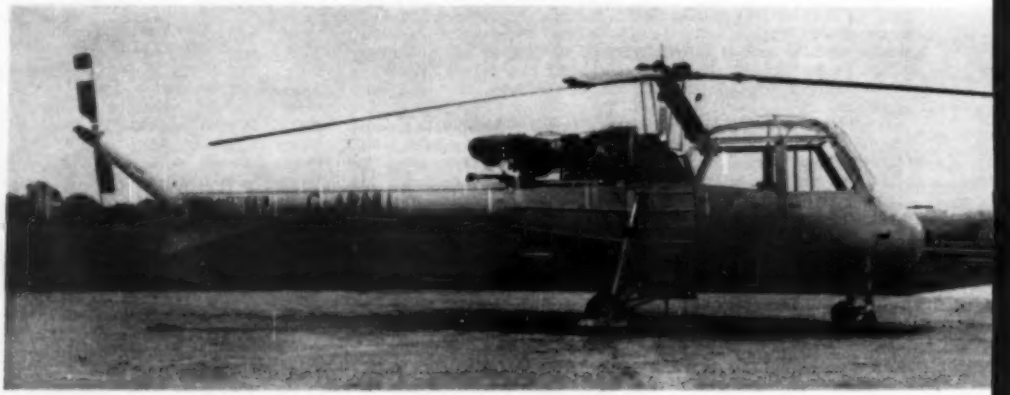
The tail boom itself is very similar to that employed in the Skeeter, although, owing to the greater length of the P.531 between the main rotor axis and the rear of the forward fuselage, the first 31in of the boom have been omitted (making the new helicopter exactly the same length as the Skeeter between the axes of the main and tail rotors). In the Skeeter, steel tubes around the powerplant lead to a five-point attachment at the tail boom, but in the new design the boom is anchored by four bolts and has correspondingly repositioned stiffeners along its length. At the rear is an angle gearbox taking the drive up to a tail rotor which, as previously mentioned, is virtually identical with that of the earlier machine except for an increase in blade chord at the tip. A small tailplane is provided to increase the permissible travel of c.g.; it is not yet known whether this will be governed by the cyclic-pitch control or trimmed by a separate wheel, and the first prototype has conducted part of its flying without this surface fitted. Beneath the tail boom is a honeycomb-sandwich ventral fin which counteracts the effect of the greater side area forward of the c.g.

Blades for the tail rotor are manufactured by Hordern-Richmond, Ltd. Construction follows this manufacturer's well-known practice, the leading edge being made from spruce and the trailing edge being manufactured from balsa, the whole then being covered with fibre-glass bonded by cellulose lacquer and provided with a Redux-bonded stainless-steel leading edge to resist abrasion. Similar construction is envisaged for the Hordern-Richmond main rotor blades of the P.531 Mk 1. The first prototype, however, has main rotor blades similar to those employed in the Skeeter, with a metal structure and fabric-covered trailing edge. In principle, the hub is identical to that used on the three-blade Skeeter rotor,



although the new machine has blades which can be folded and stowed above the tail boom. Although the P.531 is being fitted with a three-axis auto-stabilizer—and can have an autopilot—it is the firm belief of Saunders-Roe that powered controls should not be necessary in a machine of this size. The controls are, therefore, fully manual and the control forces are so low that the cyclic-pitch stick is centred by rubber bushes in torsion turned by servo motors.

Climbing into the P.531 one is immediately struck by the unobstructed roominess of the interior. Following conventional helicopter practice, the pilot sits to starboard, where he is confronted by a full-width instrument panel of attractive design. A number of the instruments are of the miniature 2in size and in certain cases two or more scales are employed on one dial. Each instrument has individually controlled Thorn red edge-lighting. A row of red press-to-test buttons for such services as the starter,



Despite its greatly increased capacity and weight-lifting ability the P.531 is scarcely larger than a Skeeter. Rotor diameters are identical and the increased length of the rear fuselage is precisely compensated by a 30in reduction in the length of the tail boom. It will be noted that, unlike the Skeeter, the P.531 has four wheels.

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TURBINE-POWERED 5-SEAT HELICOPTER

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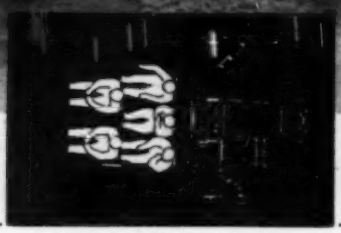
THE P.531 fills the need for a versatile, all-purpose helicopter which has a high performance in all climatic conditions. The combination of a 4-bladed rotor and free turbine engine results in smoothness of flight and simplicity of operation. The Blackburn 'Turmo' 600 Series power unit, of simple design and robust construction, develops 425 SHP and eliminates the need for a clutch in the transmission. The P.531 is recommended as a liaison aircraft, light freighter, weapon carrier, or turbine trainer; and for casualty evacuation, air-sea rescue and reconnaissance. The obvious versatility of this aircraft makes it ideal for civil or commercial use.



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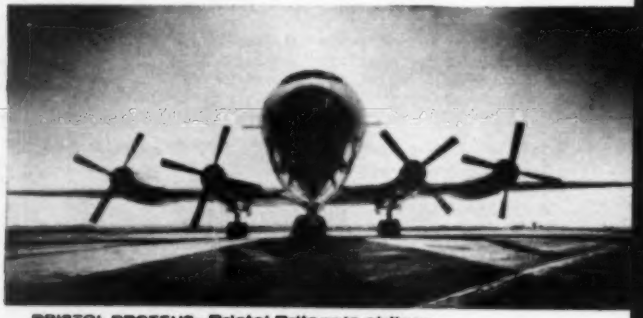
Below and opposite: engines of the allied companies in some of their many world-wide rôles

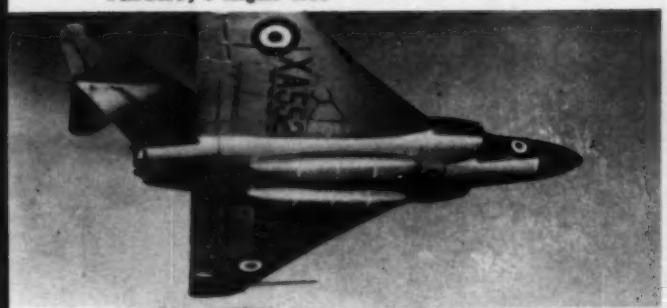
ARMSTRONG SIDDELEY SAPPHIRE—Hawker Hunter Mk 2 and 5 fighters



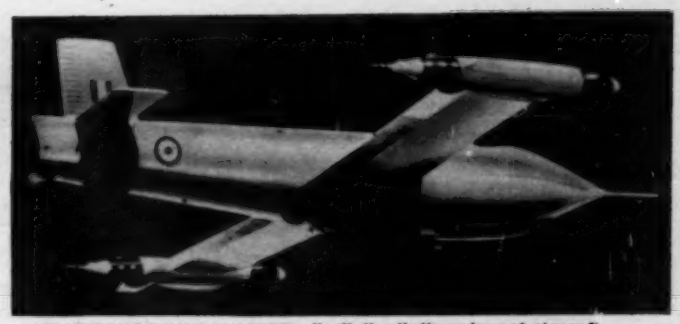
BRISTOL PROTEUS—Bristol Britannia airliner

BRISTOL ORPHEUS—Folland Gnat fighter and trainer

BRISTOL ORPHEUS—Fiat G 91 strike fighter and trainer

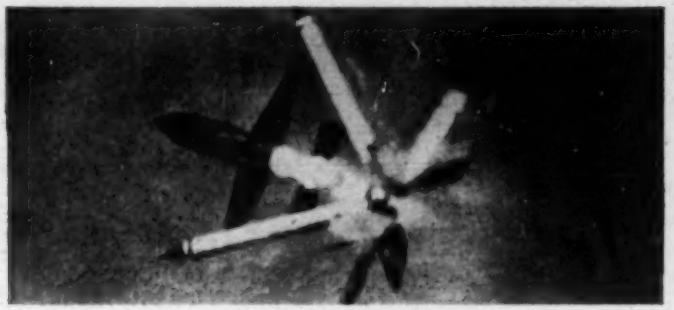


ARMSTRONG SIDDELEY SAPPHIRE—Gloster Javelin all-weather fighter



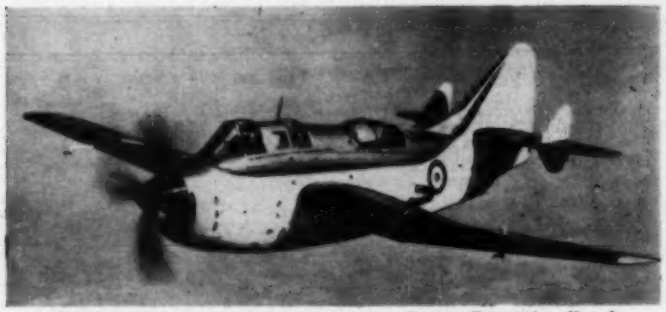
ARMSTRONG SIDDELEY VIPER—Jindivik pilotless target aircraft

ARMSTRONG SIDDELEY SAPPHIRE—Handley Page Victor bomber



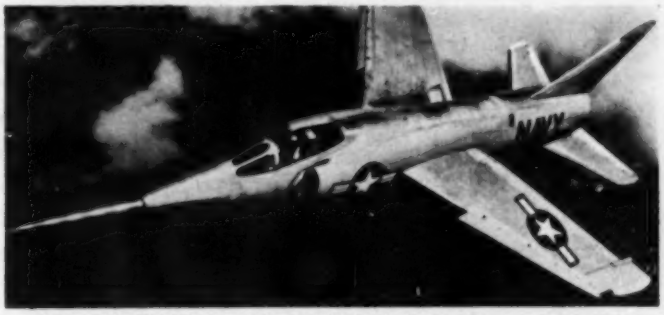
BRISTOL THOR—Bristol/Ferranti Bloodhound missile

ARMSTRONG SIDDELEY VIPER—Hunting Jet Provost trainer



ARMSTRONG SIDDELEY DOUBLE MAMBA—Fairey Gannet anti-submarine aircraft

BRISTOL ORPHEUS—Breguet 1001 Taon strike fighter



ARMSTRONG SIDDELEY SAPPHIRE (WRIGHT J 65)—Grumman F11F-1 Tiger naval fighter

BRISTOL ORPHEUS—Lockheed Jetstar executive transport prototypes

BRISTOL OLYMPUS—Avro Vulcan bomber

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SAUNDERS-ROE P.531 . . .

fire-warning and fuel-pump failure are mounted on a prominent white line, and a particularly striking instrument is a square doll's eye for the l-p. fuel cock (which is operated by a remote solenoid).

The entire instrument panel can be withdrawn by removing four bolts, and access to the rear of the panel and the foot-pedals can be gained through the fibre-glass nose. The first P.531 has dual controls, and each cyclic-pitch stick is provided with a press-to-transmit trigger and a four-way trimming button under the pilot's thumb. Between the forward seats are the levers for wheel- and rotor-brakes and the fire extinguisher.

As the Turmo compressor runs at a governed r.p.m., and has no mechanical interconnection with its output shaft, it is possible to choose any desired governed rotor r.p.m. irrespective of engine output, and to make engine handling largely an automatic process. As previously noted, the P.531 Mk 1 will have a powerful rotor brake capable of locking the rotor against the torque developed by the Turmo at idling speed. In the present machine, however, the rotor brake is taken off before starting up, and the collective-pitch twist-grip is locked in the idling position corresponding to rotor r.p.m. of about 200.

Next, the pilot determines the rotor r.p.m. required for an optimum take-off under the weight/altitude/temperature conditions prevailing, and this value can then be set by a lever on the roof panel. The Turmo is then started in the conventional manner by turning on the fuel booster pumps, l-p. cock and h-p. cock, and pressing the ignition and starter buttons together. At about 6,000 r.p.m. the engine lights up and it is then possible to release the ignition button; the starter button can be likewise released at the self-sustaining speed of between 8,000 and 10,000 compressor r.p.m. When the engine is idling, the next action is to unlock the collective-pitch hand-grip and turn it to the "power on" position which opens the throttle of the Turmo fully. Downstream from the throttle is the free-turbine governor, and this then selects the fuel flow for the chosen rotor r.p.m. The governor remains sensitive to rotor speed, so that thenceforth engine and rotor handling is conducted automatically. At all times the collective-pitch hand-grip can over-ride the governor to prevent a catastrophic run-away; and the pilot can, should he so desire, revert to manual control voluntarily.

For training purposes it is possible to fly the P.531 as an ungoverned machine; one can lock the governor in the fully opened position by selecting maximum rotor r.p.m. and thereafter fly the aircraft on the twist-grip in the traditional manner. Response of the Turmo is excellent; full load has been applied suddenly and the engine lag proved to be of a satisfactory order.

As it exists at present, the P.531 can be used for liaison, turbine training, all kinds of rescue operations, light freighting, reconnaissance, weapon carrying and casualty evacuation. In the rescue rôle, standard equipment includes a Lucas air-driven 440-lb hoist mounted on a tubular framework on the starboard side and consuming 0.066 lb/sec of bleed air at 40 lb/sq in. Two stretchers can be mounted transversely at the rear of the cabin with their ends covered by canvas flaps; the forward port seat can be unclipped and turned to face rearwards for use by a medical attendant. Possible loads and equipment in other rôles are legion, and P.531s will also be equipped to carry external loads (normally up to 1,200 lb) from four anchorages on the underside of the fuselage. The existing cabin floor should be adequate for most purposes, but a fibre-glass structure could be superimposed for freight duties involving concentrated loads.

The prototype has full dual control, although the left-hand cyclic-pitch stick is not fitted here. Some notes on engine starting are given on this page, following comments upon the neat instrumentation.

As previously noted, the rough design was finalized on December 31 last. The mock-up was completed at the end of February and ground running of G-APNU started on June 19. By the fourth week of July the Turmo had completed 25 hr of ground running, with excellent results from strips of the transmission. The flight engine was delivered on July 16 and G-APNU flew on July 20 in the hands of Ken Reed, Saunders-Roe chief helicopter test pilot. Five very satisfactory hours had been flown by July 29.

The second prototype is now approaching completion and both should be present at the forthcoming S.B.A.C. Display. Both machines have been constructed as a completely private venture by Saunders-Roe, and it is worth noting that Blackburn and General Aircraft and the other major accessory firms have in many cases either lent equipment or provided it on favourable terms in order to assist Saro in this most promising programme.

As previously noted, the basic design has very great development potential. Saro consider that, as a strengthened transmission is in any case required for a fully rated Turmo, the logical step is to design for a shaft-power of approximately 650 s.h.p. and then fit a later production machine with an engine in the 1,000-h.p. class, such as the Blackburn A.129, de Havilland Gnome, Armstrong Siddeley P.181 or Napier E.222 Gazelle Junior (all of which have been described in *Flight*).

De-rated to 600/650 s.h.p., such an engine would provide a development of the P.531 with really capable performance, particularly at high altitudes and in the tropics where it has in the past been a *sine qua non* to expect indifferent rotary-wing performance. Meanwhile, the Mk 1 will have a fully rated Turmo of 425 s.h.p. Although it will be more affected by altitude and climate than its successors, it will offer greatly improved performance over anything currently available in its class. Barring unforeseen misfortunes, Saunders-Roe should be able to achieve a production run lasting from five to 10 years.

PIPER STANDARDIZES AUTOPILOTS

IN future all Piper Apache, Comanche and Tri-Pacer aircraft sold with full radio equipment, i.e., *de luxe* versions, will be described as "AutoFlite" and fitted with a fully transistorized electric autopilot taking attitude and heading information from specially modified artificial horizon and gyro D.I. Full attitude and heading control will therefore be provided automatically except during landing and take-off.

Several autopilots of this type are already on the market in the U.S.A., notably the electric Federal F-300 and pneumatic Tactair T-3. Lear are producing the Arcon automatic rudder control, which can be engaged during landing and take-off as well as during normal flight.

SOLAR-SYSTEM GUIDE

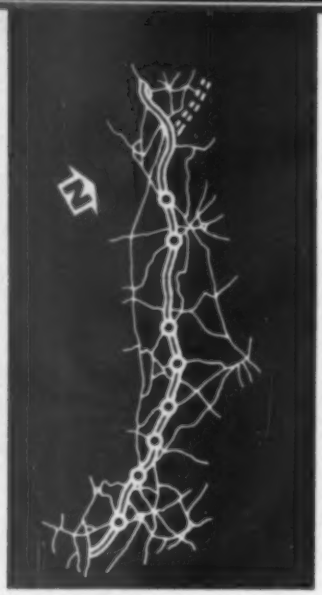
RECENTLY produced by A. Howard Freeman and Co., is the "Solascope" guide to the solar system. This device, which comprises two rotating indicators, one mounted on each side of a card on which 23 characteristics—such as diameter, mass, escape velocity, distance from Sun, orbital velocity—are printed as a circular scale, gives quantitative details of the Earth, Moon, Sun, Mercury, Venus, Mars, Saturn, Jupiter, Uranus, Neptune and Pluto. The Solascope costs 7s 6d and is obtainable through W. H. Smith and Sons or from the Howard Freeman company at 44 London Road, Kingston, Surrey.

STANDARDS FOR WASHERS

NEW British Standards have been published specifying the materials, dimensions and finish of a range of packing washers for use with aircraft bolts with unified hexagons. Provision is made for mild steel, corrosion-resisting steel and aluminium alloy washers, suitable for use with bolts of sizes ranging from 4-UNC to one-inch UNF. Copies of the new Standards, SP. 122 to 125 (published in one document), are obtainable from British Standards House, 2 Park Street, London, W.1, price 3s. Postage is charged extra to non-subscribers.

TECHNICAL AUTHORSHIP

A NEW four-year, part-time course of study in technical authorship, leading to intermediate and final examinations, has been inaugurated by the City and Guilds of London Institute. Details of the syllabus and regulations are contained in the Institute's leaflet No. 229, *Technical Authorship*, obtainable price 9d including postage) from Gresham College, Basinghall St., London, E.C.2.



A HIGHWAY AND A HELICOPTER

WORK on the new London-to-Yorkshire motorway is being assisted by the use of a Bristol Sycamore helicopter. This 53-mile stretch of road is one of the biggest civil engineering projects ever tackled in Britain, and its very size imposed a major problem of supervision. When engineers wanted to survey their progress they found it took four days to cover the complete route by car. Quick, up-to-the-minute reports were impossible—until the arrival of the "chopper." Now John Michie, project general manager in charge of operations, can take off from a little landing site just outside his headquarters at Newport Pagnell, fly over the whole project, and be back at his desk ninety minutes later.

The helicopter has been found particularly useful in deploying equipment, for flood-spotting, and for carrying personnel between impromptu conferences along the route; it is put down just where it is needed. If trouble arises, the manager can fly over the area affected and sort things out literally on the spot.

The motorway involves the construction of 130 bridges and six major flyovers, requiring the use of a quarter of a million tons of cement and 12,000 tons of steel reinforcement. Twelve million cubic yards of earth are to be excavated before the two-and-a-half million square yards of asphalt and tarmacadam can be laid on the road's stone and concrete foundations. M. A.

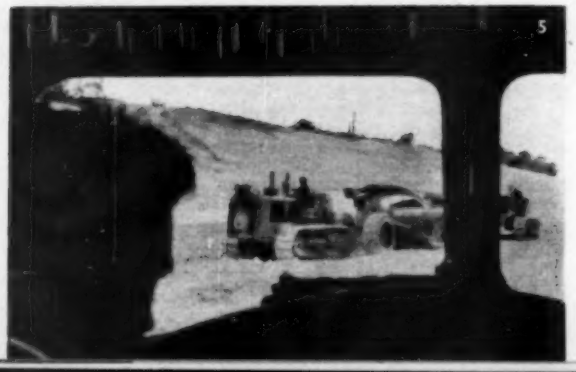
1 *A bird's eye view of the road at the point where it passes under the Luton-Dunstable railway.*

2 *The Sycamore can fly over the entire route and back in ninety minutes. The equivalent survey by road would take four days.*

3 *When day is done: The temporary "helistop" constructed outside the headquarters of John Michie, the project general manager in charge of this ambitious undertaking.*

4 *A potential bottleneck is studied from the air so that a quick solution can be worked out.*

5 *Here the Sycamore has actually landed on the motorway. Through the cabin window one of the big twin-tractor-powered earth-moving machines can be seen—part of the £5,000,000 worth of equipment being used.*



Straight and Level

MUCH of my day seems to be spent reading lists of things bought by the U.S. armed Services or Defense Department. Items like *"Scharnhorst and Gneisenau, Inc., study contract to determine feasibility of appointing committee to assign system of priorities for existing programmes to reduce paperwork in Air Materiel Command contractural procedures for Government Furnished Equipment, $2,345,678"* come up quite often; or perhaps *"Tirpitz, Inc., product-improvement program, modernization, restoration and rehabilitation of tooling, training and indoctrination and manufacture of simulators to accustom navigators to use of power-driven pencil-sharpeners in B-52 aircraft, $15,678,901."*

Then somebody decides too much money is being spent, and the resulting probe takes three months, produces six billion words, causes three suicides and innumerable white hairs, sets everything back by half a year and costs a million dollars. It is decided to lop $100,000 off the budget of some department which, although doing a good job, couldn't shout about it quite loudly enough.

And the next day Russia sends up an even bigger Sputnik, so a crash vote is taken to spend another fifty billion.

Yet America could, if she so desired, produce a paradise on earth; she could move mountains, bridge rivers, build supersonic airliners, halve the costs of transport, feed underfed millions, cure countless incurables. Only the economic battle, surely, can decide the result of the cold war with Communism.

● So thoroughly did Britain publicize the early troubles of the Proteus that even well-informed people still think it is a troublesome engine. Some of the mud so self-denigratingly thrown about 18 months ago (and even now being thrown about, see page 209) still clings—so much so that even well-informed people like Mr. C. O. Turner of Qantas can say how pleased they are to see that the engine is "getting over its troubles."

Yes, it is getting over its troubles—so much so that the 705's overhaul life was last week extended from 1,300 hr to 1,600 hr; a further extension to 1,900 hours is in prospect. When I heard this news I recalled a remark made in Parliament a few weeks back. Talking about alleged troubles with the American Turbo-Compound piston engine, a Member said: "Had this been a British engine we should never have heard the end of it. Every newspaper would have reported every single engine failure."

I am sorry to say that not one newspaper gave one line to the astounding Proteus achievement (it *is* astounding—you ask any U.S. aero-engine firm). But had a Britannia been delayed with Miss Daphne Dormouse (39½-21-36) on board, due to a fuel pump gasket leak or something, this would have been on every front page. I'm not blaming the air correspondents—just their news editors.

Hats seem to be in fashion in this column. First we had the airborne (garden party) types; now see how cautiously Mr. George Ward, the Air Minister, disposes of his trilby before setting off in his Chipmunk to visit the R.A.F. station at West Malling, Kent.

● What a wonderful opportunity Sir Gerard d'Erlanger had at his Press conference last week to blow a trumpet for the Britannia. "Last year," B.O.A.C.'s chairman *might* have said, "the Britannia came in for strong criticism. But that is all past now, and I would like to say how delighted we are with the aircraft's performance and results. . ."

A few words to this effect would have cost B.O.A.C. nothing, and would have done the Britannia (*and* B.O.A.C.) a power of good. Such praise as was forthcoming was faint and rather grudging. How different was the strength of El Al's praise for the Britannia the week before.

● Did you see the news story about the strange object, five feet by two, found among the rocks at St. Clement's Bay, Jersey, earlier this summer? After a lot of deciphering of serial numbers, the U.S. Air Attaché in London told the Channel Islanders "The item in question is the left-hand aileron of a Snark missile fired from Cape Canaveral on July 26, 1956." If things go on like this we shall have Russian fishermen steaming back to port with an assorted cargo of fish, Thor motors and Atlas nose cones.

It is not so long since *Flight* commented on the retort of a Douglas spokesman asked about the need to expand N.Y. International Airport (where runway extension is limited by Jamaica Bay). "Fill in the lousy bay," he said. Seems to me someone had better fill in the lousy Atlantic. Then the U.S. missile men will make sure that nobody else gets the bits of their missiles; they might even get them back themselves—as the Russians do, and as we can do at Woomera. (Incidentally, the U.S.A.F. did not want their aileron back.)

● We have long been accustomed to such terms as avionics and nucleonics, and to company names like Autonetics and Astrodyne. Here is a rather newer one, which I hope will not catch on because it is very much less euphonious. It is missilonics, referred to in Radio Corporation of America's latest annual report.

● Last week one of my large staff of ace reporters interviewed Sir Charles F. Boost, famed ex-barnstorming pioneer bush pilot who is now chairman of Plummet Air Lines. Asked for his views on a fare-differential between jets and propellers he said:—

"Ridiculous. I see no future for propeller aircraft. Steam-driven airliners I call 'em! We offer the public speed—that's what they want, you know. Why penalize what the public want? Our object is to replace equipment as fast as we can, so as to offer the most super de luxe travel. My chaps can't wait to offer their passengers supersonic travel—just imagine, England to the Continent in three minutes! But you must remember how low our profit-margins are. People just don't realize how expensive it is to run an airline. Depreciation is a big factor, you know . . ."

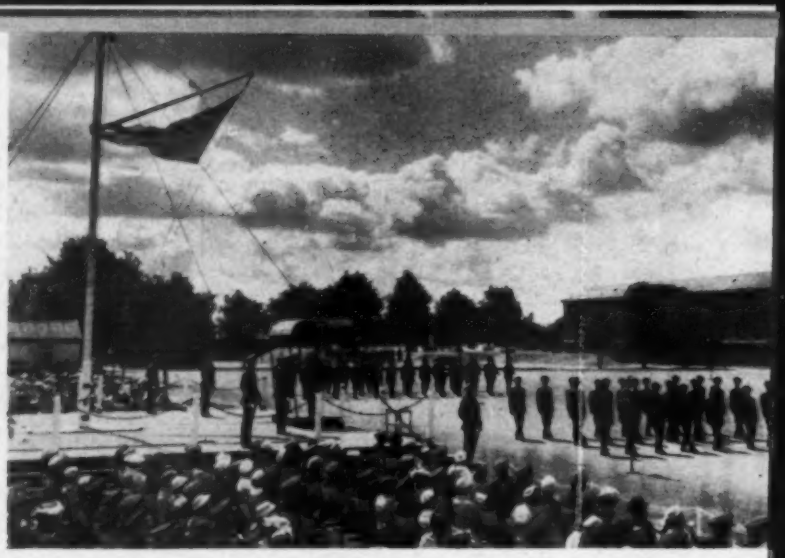
● To get the other point of view (you know I always like to be fair and balanced) my reporter went to talk with Mr. Archibald Jogtrotter, managing director of Turboprop Investments, Ltd. Did *he* think a fare-differential was needed?

"Most emphatically," declared Mr. Jogtrotter. "The airlines have gone crazy buying all these jets, plum crazy. They should of course have bought our turboprop TI-221 Profitliner, having first of all scrapped I.A.T.A., I.C.A.O., all bilateral air agreements, and everything else that restricts the natural economic growth of air transport. Let there be free competition of the skies, I say, with Profitliners making a profit for everybody who is sensible enough to see their superiority to jets, which they can undercut on fares by 164.6 per cent at least. . ."

● Hoping that the Government might have a policy on the fare-differential, I went to talk to the Minister of Planes, The Rt. Hon. Mr. Hugh Strangeways.

"You know, this is really an airline matter," he said. "But of course I am always ready to consider suggestions from any quarter—I repeat any quarter—on this very important, and I underline the word important, matter. . ."

ROGER BACON



Gen. Lauris Norstad, Supreme Allied Commander Europe, inspecting the passing-out parade at the R.A.F. College, Cranwell, on July 29; and at right, the summer scene at the R.A.F. Technical College, Henlow, when the Secretary of State for Air, Mr. George Ward, took the salute at the march-past during the passing-out parade there on July 23.

SERVICE AVIATION

Royal Air Forces and Naval Flying News

Two New Standards

STANDARDS are to be awarded to Nos. 38 and 64 Squadrons, both of which completed 25 years' service on April 1. The Queen's approval of these awards was announced in the *London Gazette* for July 29.

No. 38 (M.R.) Sqn., commanded by W/C. J. R. Saunders, is based on Malta and equipped with Shackletons. Formed in 1916 as a home defence unit, it moved to France as a bomber squadron then was disbanded in 1919. During the early part of the Second World War (having been re-formed in 1935) it operated Wellingtons in Bomber Command, moving to the Middle East in 1940 and from 1942 onwards being engaged mainly in the torpedo-bomber rôle against enemy shipping.

Also formed in 1916, No. 64 Sqn. went to France a year later as a fighter squadron and saw much action in air combat and ground attack rôles. It was disbanded in 1919 and re-formed in 1936, being equipped with Blenheims at the outbreak of the Second World War. In 1940 it re-equipped with Spitfires and was actively engaged during the Dunkirk evacuation and in the Battle of Britain. In the period 1941-43 it undertook many offensive sweeps and from 1944 onwards gave support to the Allied forces liberating Europe. Now based at Duxford, Cambs, the squadron is equipped with Meteor N.F.12s and 14s and the C.O. is W/C. J. A. Wright.

Beleagured Habbaniyah

FIRST news of what has been happening at R.A.F. Habbaniyah since the Iraqi revolt began was given in an interview with newspaper correspondents last week by the station commander, G/C. H. I. Edwards, V.C. He said that the 1,200 personnel at Habbaniyah, which was immediately surrounded by tanks and guns of the Iraqi Army when the Baghdad revolution occurred, "worked normally for the first three days after the coup"; but there was not much for them to do now. Signals were sent out for those three days, but messages were then stopped by the Iraqis. Before the coup, said G/C. Edwards, about 250 aircraft a month were flying in and out—but latterly nothing had flown in except Iraqi Air Force machines. Under a previous agreement, the Iraqis flew Venoms, Hunters and Vampires at Habbaniyah and shortly before the revolution the Americans—who have a detachment at the station to train Iraquis—flew in five Sabres, and more were to follow.

G/C. Edwards said that the station had enough rations for three months but because of the emergency they were rationing beer to two bottles a day and cigarettes to 20 a day. Some 50,000 lb of flour had been brought in and the Naafi had six months' stocks. "There are fears for the future, which is uncertain," added G/C. Edwards, "but morale is high." Since the coup he has been the only man allowed out of the station, when he visited the Chief of General Staff of the Iraqi Army at the Ministry of Defence.

Nearly 500 lb of mail for R.A.F. personnel at Habbaniyah, which had accumulated in Cyprus since the start of the Iraq emergency, was to be flown to Baghdad on July 30 for onward transmission to the station.

Apprentices Wanted

VACANCIES exist in the R.A.F. for 550 young men to train for regular posts in advanced Service trades—450 as aircraft apprentices and 100 as administrative apprentices. Age limits for the former are 15 to 17 (or, exceptionally, 17½) and for the latter 16 and 17 (exceptionally, 15½ to 17½), on January 1 next. Full details are given in A.M. pamphlet 339, and applications—which must reach Air Ministry (E.S.5b), London, W.C.1, by September 14—should be made on R.A.F. form 4780. This is obtainable from the Central Recruiting Office, Air Ministry, London, W.C.1, or from any other recruiting office.

R.A.F. Postings

AMONG various appointments recently announced by Air Ministry are the following:—

G/Cs J. A. Crockett to be Air Attaché, Rio de Janeiro. (He will also be accredited Naval and Military Attaché); W. G. Morgan to Air Ministry for duty in the Department of the Air Member for Personnel; E. J. Smith to Air Ministry for duty in the Department of the Air Member for Supply and Organization; R. F. Aitken to the R.A.F. Staff College, Andover, as Assistant Commandant; C. B. E. Burt-Andrews to R.A.F. Bridgnorth to command; R. M. B. D. Duke-Woolley to H.Q., Fighter Command, for air staff duties; I. G. Esplin to R.A.F. Wartling to command; C. J. G. Ferguson to the Air Ministry for duty in the Department of the Air Member for Supply and Organization; W. T. H. Nicholas to SHAPE for staff duties; W. J. Stutchbury to No. 2 Stores Depot, R.A.A.F., to command, under the exchange scheme; M. C. R. White to No. 25 M.U. to command.

W/Cs R. S. C. Cater to Air Ministry, for duty in the Department of the Air Member for Personnel; W. C. Clements to Air Ministry, for duty in the Department of the Air Member for Supply and Organization; W. A. Cormack to H.Q., 2nd T.A.F., as Chief Photographic Officer; W. Kemplay to Air Ministry, for duty in the Department of the Air Member for Supply and Organization; H. H. Mayoh to No. 1 School of Technical Training, Halton, for education duties; F. H. Peterson to Air Ministry Unit, Ruislip, as S.M.O.; J. F. Sanders

Five Lincolns of No. 1 Sqn., R.A.A.F., which recently returned to Australia after eight years' service in Malaya, taking part in a ceremonial fly-past over Sydney.

Final decision required within two hours
— at a meeting 300 miles away

He has a big decision to make, quickly. In two hours' time he must face a meeting 300 miles away with his mind already made up.

He is in his office, all the necessary papers are to hand. He is travelling at nearly three miles a minute.

He is in the Company's executive aircraft, a Heron, fully equipped, four-engined. He finds it economical; his own time is more expensive than most things.

The de Havilland HERON Executive Aircraft

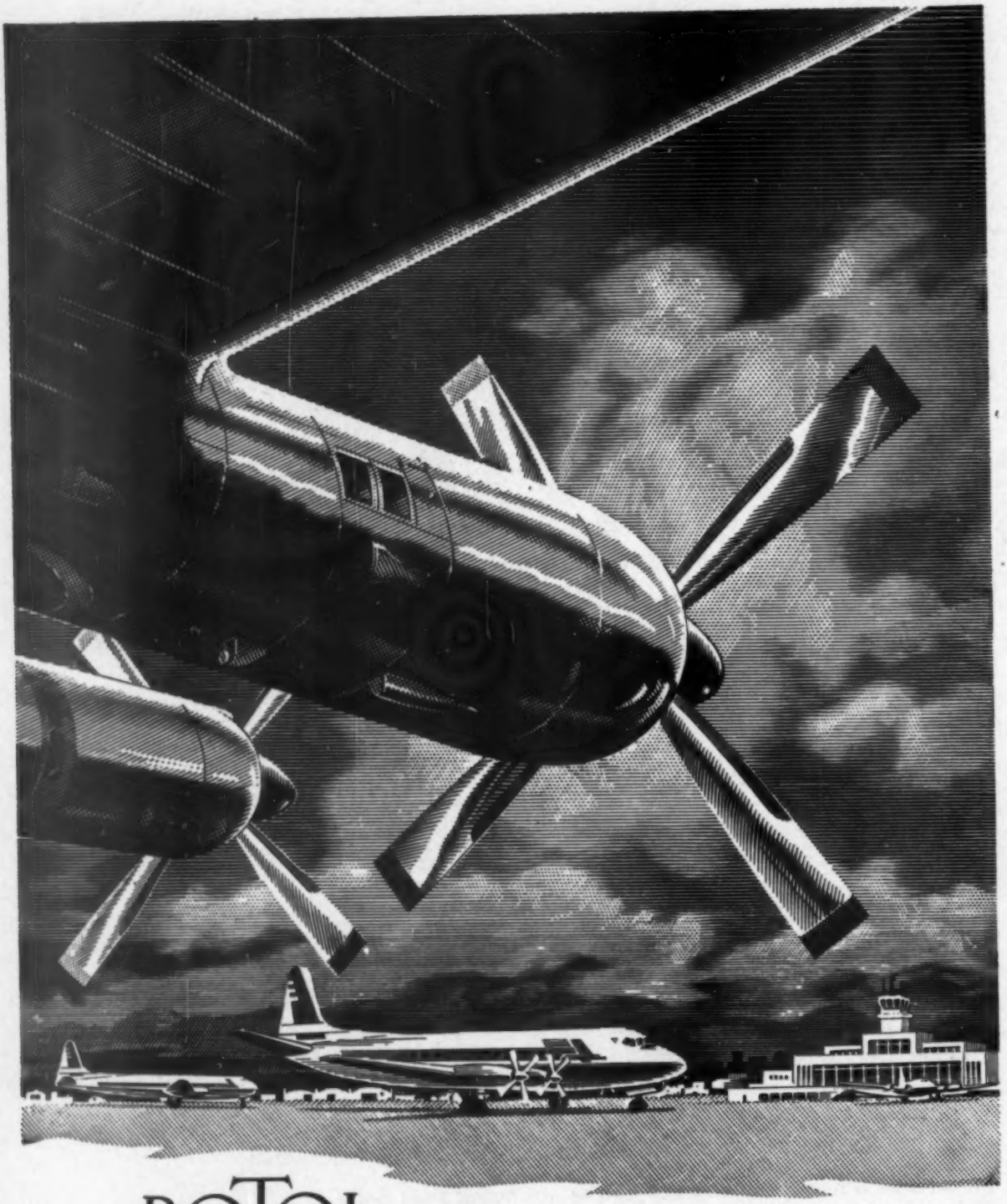
powered by four de Havilland Gipsy Queen engines driving de Havilland propellers

EMETT **on thermal de-icing**

Emett's de-icing system appears to be based on the theory that at any altitude a hundred hot-water bottles are better than one.

For our part, we are confident that at all levels aircraft people will be much happier with Dunlop Thermal Aviation Equipment.

DUNLOP **on the world's leading aircraft**



ROTOL PROPELLERS AND GEARBOXES
ARE FITTED TO ALL TYPES OF
ROLLS ROYCE DART ENGINES

SERVICE AVIATION . . .

to No. 1 School of Technical Training Halton, for education duties; J. M. Stevenson to No. 16 M.U., Stafford, for administrative duties.

S/L.s B. Armiger to R.A.F. Newton, for administrative duties (with acting rank of wing commander); N. P. W. Conquer to R.A.F. Sundern, Germany, for planning duties (with acting rank of wing commander); P. R. Mallorie to R.A.F. College, Cranwell, as Deputy President, R.A.F. Selection Board (with acting rank of wing commander); R. S. Mortley to H.Q., No. 2 Group, for training planning duties (with acting rank of wing commander).

Five F.C.U.s Disbanding

FIVE R.Aux.A.F. fighter control units—Nos. 3500 (County of Kent), 3507 (County of Somerset), 3602 (City of Glasgow), 3608 (North Riding) and 3701 (County of Sussex)—are to be disbanded under the reorganization of the control and reporting system. These disbandments were announced by the Secretary of State for Air, Mr. George Ward, in a written Parliamentary answer on July 30. He also said that No. 3603 (City of Edinburgh) F.C.U. was being retained "for the time being" as it might be required in a new rôle associated with the war functions of No. 18 Group, Coastal Command. Adding that the date of disbandment would be October 15, Mr. Ward said he would like to express sincere thanks to the public-spirited men and women of the five units which are to be disbanded.

These Air Ministry pictures show how the R.A.F. has settled down to its work in Amman after the airlift to Jordan. In the top row, left to right, S/L. J. H. Granville-White, C.O. of No. 208 Sqn., discusses an Avpin starter problem with one of his senior technicians; stores for the airlift are loaded into a Beverley at Nicosia; and airmen discuss that perennial M.E. problem, "dhobie." Bottom row, a Hunter F.6 is serviced; rocket rails are fitted; and F/O. N. H. Evans of No. 208 Sqn. signs a F.700 with S/Tech. A. F. Cornah standing by.

F/L. K. Henderson, winner of the R.A.F. Escaping Trophy, with his award after it had been presented to him on July 29 by Air Chief Marshal Sir Ronald Ivelaw-Chapman, chairman of the R.A.F. Escaping Society; and, on right, Brig. G. J. S. Chatterton, wartime commander of the Glider Pilot Regiment, looks at a memorial to the regiment after it had been dedicated at a service which was held in the crypt of St. Martin-in-the-Fields, London, on July 25.

IN BRIEF

The R.A.F., with 165 points, won the team championship in the inter-Services athletics contest at Aldershot recently. The Army came second with 124 points and the Royal Navy third with 81.

* * * * *

The Central School of Aircraft Recognition has now changed its location from Uxbridge to West Malling and all future correspondence should be addressed to R.A.F. West Malling, Maidstone, Kent.

* * * * *

Twelve boys from Vanbrugh Castle, the R.A.F. Benevolent Fund's school at Blackheath for the sons of deceased airmen, are to attend the annual R.A.F. camp at Calshot from August 12 to 22. It is run by Canon A. S. Giles, Chaplain-in-Chief of the R.A.F., assisted by chaplains of all denominations, and caters for 180 boys, mainly sons of R.A.F. personnel.

* * * * *

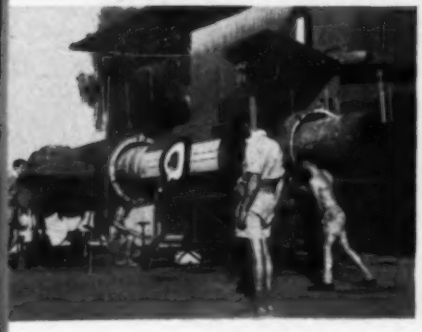
Flight cadets from the R.A.F. College, Cranwell, are again participating in widely varied kinds of summer vacation activities. These include pot-holing in Eire, a trip to the Outer Hebrides, gliding in Hampshire, a visit to the Joint Anti-Submarine School at Londonderry, horse-riding in Scotland, a month's cruise in the R.N. frigate H.M.S. *Carron* and visits to various NATO headquarters in Europe.

* * * * *

A tie is now available (at any branch of Gieves, Ltd.) for officers who have served or are serving on the staff of the Joint Anti-submarine School, Londonderry. Its design incorporates the albatross of the R.A.F. superimposed upon the anchor of the Royal Navy in silver set diagonally upon a dark blue background. The lines of the joint crests are separated by a light blue diagonal stripe.

* * * * *

Over 1,000 Service M.T. drivers have now passed through "skid pan" accident-prevention courses at the R.A.F. Police Driving School at Wahn, near Cologne, in 2nd T.A.F. These were started in 1955 to familiarize police with German road conditions and proved so successful that they were extended to other R.A.F. drivers. During the course, drivers cover about 30 miles on the lubricated surface, skidding approximately 27 times every mile.



The de Havilland production plant at Chester appears to be making quick strides with its Comet 4 programme: here is B.O.A.C.'s fifth aircraft, G-APDE, nearing the flight stage. The first Comet 4s will come off the parent production line at Hatfield.

CIVIL AVIATION

SOLENT ACCIDENT REPORT

THE report of the Public Inquiry into the Aquila Airways Short Solent flying-boat accident on November 15, 1957, concludes that the *essential* cause remains unknown. In the opinion of the Court the accident resulted from: "The stoppage of the No. 3 engine at a time when the No. 4 engine was stopped. The cause of the stoppage of the No. 4 engine is unknown. The cause of the stoppage of the No. 3 engine was either an electrical failure in the fuel cut-off actuator circuit or the accidental operation of the cut-off switch."

The circumstances of the accident were that the aircraft, G-AKNU, took off from Southampton Water bound for Lisbon *en route* for Madeira with 50 passengers and a crew of eight. It made a normal climb and, three minutes later, passed a routine departure message to Southern Air Traffic Control Centre, London. At 2254 hours, however, the radio officer called the Aquila base at Southampton and transmitted this message: "No. 4 engine feathered. Coming back in a hurry." Approximately one minute later the aircraft crashed into the face of a quarry between Chessel and Brook in the Isle of Wight. The wreckage caught fire and, despite the efforts of a number of people who quickly came to the scene, none of the crew and only fifteen of the passengers survived.

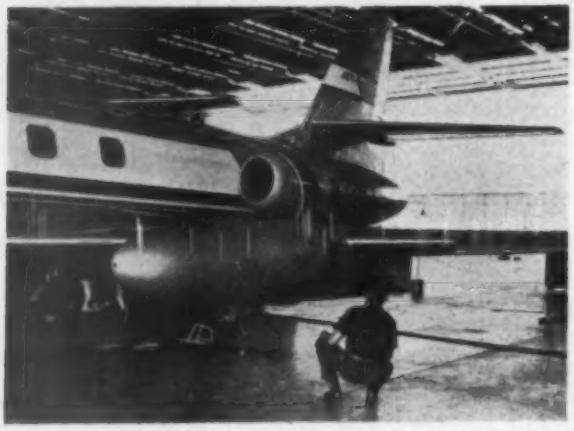
The possible operation of No. 3 cut-off actuator could have been effected in a number of ways, "none of them proved, all of them unlikely." But the theories put forward about the possible operation of this switch involved an error by the First Officer, and the Commissioner says: "Justice would not be done to the late Mr. Scarr unless I emphasized that there is no evidence at all of any error on his part."

WRIGHT TURBO-COMPOUND CRITICISMS

SOME operators have experienced considerable trouble with Wright 988TC Turbo-Compound engines in service and the incidence of unscheduled featherings and engine-changes has been high. Others have had relatively little trouble. Resulting differences of opinion between Wright and some of the operators came to a head recently when the Italian journal *Settimana Alata* wrote that the certificate of airworthiness for the engine should be reviewed because of an unsatisfactory reliability record; and a translation of the article was forwarded by Alitalia to Wright. A particular instance cited was the crash of the Sabena DC-7C at Casablanca in May, in which the failure of a second engine was at first stated to be the cause. It was subsequently established that, although failure of one engine was responsible for the attempted emergency landing at Casablanca, the actual accident was caused by pilot error. While recording this, *Settimana Alata* stuck to its original contention that the 988TC engine was not as reliable as it should be and claimed that Wright were not doing all they might to remedy the situation.

Wright responded that modifications took time and required full testing. Many of the failures, they stated, were in any case caused by improper operation of the engines; and some operators were irked by having to incorporate expensive modifications designed to cure faults they had not themselves experienced to any extent. One result of the whole controversy is that C.A.A. is issuing an airworthiness directive for covering the more important modifications; and the airlines some time ago formed an information pool on remedies for Turbo-Compound snags. Some action is therefore being taken, but the position of the engine is not seriously threatened.

The moral of all this is not that the Turbo-Compound is a nest of worms (current American idiom for troublesome equipment), but that British engines—in particular the Proteus—tend to get more than their fair share of adverse publicity. Engines *do* give trouble; but the fact that the Proteus 705, after 18 months of service, is now cleared for a 1,600 hr overhaul life suggests that it gives less trouble than the rather less powerful Turbo-Compound. The American engine, which has been operating for three years, has an overhaul life of 1,250 hr in B.O.A.C. (DC-7C) service, having started with the Corporation at 850 hr in January 1957.



E.D.P. IN ACTION

DELEGATES to the recent I.A.T.A. technical conference in London on production planning devoted much of their week to discussing the scope for electronic data processing.

Details have since been published on K.L.M.'s use of an I.B.M. 650 computer at the I.B.M. Data Processing Centre in Amsterdam. The computer has undertaken the calculation of flight plans for the 140 European routes operated by Viscounts and Convairs. In the past K.L.M., in their own words, indulged in "the traditional ritual of pre-flight planning undertaken by the pilot and navigator" whereby crew were provided with cruising tables and fuel consumption graphs, and had to calculate course and altitude according to the latest meteorological reports. Not only was this a time-consuming process but the margins of error were such that available payload was not always calculated with sufficient certainty.

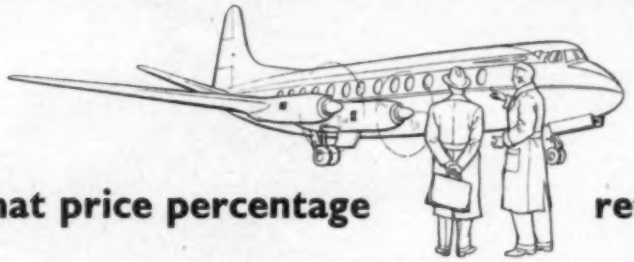
K.L.M. first tried to tackle this problem by hand. But the calculation of plans for 36 routes took three months, by which time aircraft performance and route characteristics were sufficiently changed to render the plans out of date.

The electronic flight plans assume a choice of three altitudes for each of the 100 Viscount and 40 Convair routes, and for each altitude there are four temperature groups and 13 wind components. The entire calculation of these 22,000 separate pre-flight plans took only ten hours on the I.B.M. 650, and as each flight plan takes only four minutes to compute (as against 20 hours manually), amendments made necessary by alterations to radio beacons, routes and engine performances can be made from day to day.

K.L.M. is not the only organization to employ the services of an I.B.M. Data Processing Centre for calculating flight plans. The 704 computer at the Paris centre is used by Sud for establishing plans for the Caravelle.

The Lockheed Jetstar is now fitted with these 300 U.S. gal fuel tank nacelles, increasing range from 1,730 st miles to 2,280 miles. Larger 640-gal tanks will be fitted for 3,000-mile ranges.

'Confound percentage thickness chord ratio!..



what price percentage return on investment?'

When the last aerodynamic word has been said, the airline operator still has to consider an aircraft from an economic viewpoint. He will be pleased to find that the Viscount 810/840 is as firmly founded on economic studies as on technical principles.

Its low first cost, low running costs and maximum utilisation add up to profitable operation. The Viscount 810/840 is 50% cheaper than any other four-engined turbo-prop. Although bigger than earlier Viscounts, its air mile costs are unchanged, so that seat mile costs are lower. High payloads will be ensured by the undoubted passenger preference for Viscounts on medium-haul routes.

As the 810, the new Viscount has a cruising speed of 365 m.p.h. With the more powerful Rolls-Royce engines available in 1960, the aircraft will become the 840 with speed raised to 400 m.p.h. The success of Viscounts is based on two important facts. Passengers prefer them — and they produce healthy airline balance sheets.

VICKERS VISCOUNT 810/840

FOUR ROLLS-ROYCE DART PROPELLER-TURBINE ENGINES

VICKERS-ARMSTRONGS (AIRCRAFT) LIMITED WEYBRIDGE SURREY

TGA AT586

PALOUSTE 500
AIR BLEED

TURMO 600
FREE TURBINE

ARTOUSTE 600
FIXED SHAFT

A range of Gas Turbines
developed and in production
for

HELICOPTERS

FAIREY ULTRA LIGHT

SAUNDERS-ROE PS31

KAMAN K17

These are being developed
to keep pace with the
designers' requirements
and a new range of units
in the 1,000 h.p. bracket
will shortly be available.

Blackburn
(LICENSEES FOR TURBOMECA ENGINES)

BLACKBURN & GENERAL AIRCRAFT LIMITED, **ENGINE DIVISION**, 43 BERKELEY SQUARE, LONDON W.1
E 118/a

CIVIL AVIATION . . .

B.O.A.C. 1957-58

LAST week we briefly summarized B.O.A.C.'s results for the financial year ended March 31, 1958. The Annual Report and Accounts—presented to Parliament one month earlier than usual—are here reviewed in more detail.

The Report. The chairman, Sir Gerard d'Erlanger, begins by emphasizing the short-fall in the Corporation's traffic as compared with the planned rate. Early in the report he refers to what seems to be the crucial figure among B.O.A.C.'s results—the load factor of 60.5 per cent, compared with last year's 63.7 per cent (and the planned 64.4 per cent).

Here indeed is the root cause of the Corporation's heavy loss of £2,839,350—the first deficit since B.O.A.C. first climbed into the black in 1951-52. The unit costs of production were in fact held down; the loss was incurred by the inability to sell all the increased production. Capacity ton-miles went up by 18.6 per cent, load ton-miles by only 13 per cent, with the result that load factor—the vital index of an airline's economic health—dropped by 3.2 per cent. As the chairman points out, a one per cent drop in load factor loses B.O.A.C., at its present revenue rates, £900,000 worth of business. The reasons for the decline in traffic growth, as set out in the Report, are therefore worth fully summarizing:—

(1) The effects of the fall in prices of primary commodities, and the North American business recession, which first became apparent in October 1957, persisted with increasing severity until the end of the financial year. B.O.A.C.'s services between New York and the Caribbean were "seriously affected" by the reduction in U.S. holiday travel.

(2) The introduction into service of Britannia 312s had also been "seriously affected" by late delivery from the manufacturers, with the result that "outmoded types due for retirement" had to be continued in service after their competitive lives in front-line use had declined.

(3) Services were affected by "diminution of British cabotage rights."

(4) Colonial-coach services to Africa operated by the independent airlines with Viscounts offered "serious competition" at a time when, through "delay in Britannia deliveries," the Corporation had to continue to rely on Argonauts. "Although coach-class services were designed to cater for a new class of traffic, they have in fact caused increasing inroads into the Corporation's tourist traffic."

(5) A loss of more than half a million was attributable to B.O.A.C.'s interests in associated and subsidiary companies. B.W.I.A.'s loss (£260,588) was due to a pilots' strike in October 1957, and to the fall-off of American tourists. Similarly, Bahamas Airways suffered from many months of a general strike in the Bahamas; and Hongkong Airways' loss of £176,004 exceeded that forecast.

Undoubtedly the world recession was the most important of the above factors. It might be fair to comment, however, that though Britannia 312 deliveries were indeed delayed, the front-line aircraft available to the Corporation—Stratocruisers and DC-7Bs—were adequate in terms of capacity and appeal to enable the Corporation to hold its own against competitors.

The Report's suggestion of material diversion of its African tourist traffic by independent operators raises a serious issue, and one which was emphasized by B.E.A. in its Report last year. Both Corporations can, and do, lodge their complaints on this score with the Air Transport Advisory Council (see page 211); it is presumably only after careful consideration that a complaint—which it is in the A.T.A.C.'s terms of reference to avoid—is made in public. B.O.A.C. cannot be suggesting that this cheap-fare traffic should not be carried by the Colonial-coach operators; and it is fair to put on record that B.O.A.C.'s Britannia 102 fleet was delivered by June 1957 (having been introduced into service in February 1957) and that Safari Viscount services did not begin until the following winter.

The losses suffered by B.O.A.C.'s associates (gathered together under B.O.A.C. Associated Companies, Ltd., in September 1957) were incurred by a group of companies which together are about one-fifth the size of the parent company. Thus their results—notwithstanding the value as feeder lines to B.O.A.C.—can have a serious effect on the parent company's results. However, the Report states that many of these companies can contribute to revenues *and* can become self-supporting, and it is B.O.A.C.'s policy to pursue these "twin objectives."

A good deal of prominence has been given to a suggestion in the Report that the Corporation should be assisted financially in the work of developing new British aircraft to make them "fit for competitive service and for export." This suggestion was naturally interpreted as an indication of the heavy costs incurred by B.O.A.C. in introducing the Britannia (see also discussion of this section of the Report on page 213). It is not clear whether the chairman's figure of "several million pounds" incurred in Britannia development refers to 1957-58. Examination of the Accounts shows that total Britannia costs (and training costs) not written off to date amounted to £2.65 millions. On the wider issue, however, it must be apparent to B.O.A.C. that a development contract of this kind would tend to push the burden of development on to B.O.A.C., which is what the Corporation do not want. But what development work are B.O.A.C. now anticipating? The Comet 4 will enter service as a proven and fully developed product—thanks in part to B.O.A.C.'s efforts; and their next British aircraft, the VC.10, will not be introduced for another five years.

Looking ahead, B.O.A.C. "has embarked upon a policy of very considerable expansion which it intends to pursue regardless of temporary setbacks due to abnormal causes." However, the present time is not, they say, opportune for engaging "in the more speculative forms of exploratory development which could be contemplated under more stable conditions" (a statement explained on page 213).

The Report discusses the internal organization of the Corporation, but refers only briefly to the important engineering reorganization at present in hand (the Report states that the engineering organization and the methods, as a result of the chief engineer's investigation 1956-57, had been found to require "fundamental revision"). Significantly, perhaps, the Report completely omits the traditional section devoted to staff matters.

The Accounts. To show results worse than those for 1957-58 B.O.A.C. would have to go back to the pre-Stratocruiser/Argonaut era. That happy combination of prestige and economy managed to eliminate the regular £7m losses that had been experienced each year before, and qualified the Corporation for membership of that exclusive club limited to profitably run State-controlled airlines. But over the last five years these two aircraft have aged steadily while rival equipment has been constantly improved. It needed only a trade recession—which to an airline means low load-factors—to put the Corporation back into the red.

The main features of last year's heavy loss were discussed in a preliminary review in our last week's issue, but perusal of the accounts in their entirety now allows a closer analysis to be made.

The revenue side of the operating account shows a total of £53m, the overall increase of 9 per cent corresponding to that for passenger revenue. Average passenger revenue rate fell but slightly (64.9 to 64.5d per l.t.m.), economy-class fares not yet having been introduced. Revenue from mail (£9.5m) and diplomatic bags fell, the rate for each class dropping slightly (to 112d and to 170d per l.t.m. respectively). Volume of mail was constant while that for diplomatic bags fell (surprisingly) by 11 per cent. Despite a slight increase in the average revenue rate for freight (32.2d to 33.5d per l.t.m.), volume rose by 9 per cent, total freight revenue going up 13 per cent to £4.9m. But the greatest expansion came from non-scheduled services, which contributed £2.3m (less than £1m the previous year) at an average rate of 34d per c.t.m.

Although expenditure rose by 14 per cent, the fall in unit costs from 40d to 39d per c.t.m. shows that losses were more the result of poor load-factors than of high costs. When expenditure is analysed in detail (the bracketed figures following show pence per c.t.m.), the pattern is revealed as an increase in obsolescence, insurance and maintenance that is offset by a saving in fuel. Obsolescence (2.7 to 2.8) would have been even higher but for the fact that, as the Report says, "the Stratocruiser fleet obsolescence has been recalculated so that the sum charged (is) restricted to leave a residual value equal to the contracted sale price on disposal." Fleet insurance is up sharply (0.3 to 0.5) although premium payments of £¾m on a fleet valued between £40m and £50m suggest an unusual degree of self-insurance for an institution showing an accumulated deficit. Maintenance (9.8 to 10.0) shows little sign of the Corporation's "reorganization" programme, a particularly sharp increase being shown for the cost of overhauling engines and components.

But these and other lesser cost increases were more than offset. Slight reductions were made on station and traffic-handling costs (particularly on staff) and on general supplies (such items as stationery, printing, distribution and subscriptions—traditionally the first to suffer in lean times—were cut last year by £¾m alone). But the most significant saving was on flying operations (9.2 to 8.6), most of this reflecting an increased use of cheaper fuel. Nowhere in the 45 pages of the Report is there a single word relating fuel economy, the brightest aspect of B.O.A.C.'s experience last year, to the Britannia.

Operating costs exceeded revenue by £165,551 (against £2m the previous year) and this loss is carried forward to the Profit and Loss Account. Remuneration of Board members (up sharply) and of auditors and the losses incurred by the Treforest factories and by associated companies together amount to £¾m, but this is offset by £½m interest received to bring the year's loss before paying interest on capital to £½m (£1¼m in 1956-57). This last item rose from £2½m to £3¾m, and after payment of £2½m (the balance of £1½m being capitalized) and allowing for other adjustments (including a £½m capital profit on surplus aircraft sales), the financial year ends with B.O.A.C. poorer by £3½m.

The balance sheet reflects strain on the Corporation's resources. In an effort to conserve capital, current assets have been cut from £23m to £20m while current liabilities have increased from £18m to £22m. Insofar as this shows "negative" working capital (i.e., minus £2m as against plus £5m the previous year), the Corporation appears to have been following an unusually stringent credit policy. Fixed assets have increased from £71m to £94m, subsidiaries are now valued at £12m instead of £4m, and development expenditure carried forward has risen from £1m to £2m. Together these represent a net investment of £108m (£82m in 1956-57).

Additional capital has come from Exchequer advances (£10m to £41m), the value of B.O.A. stock and of bank loans having declined slightly. Outstanding capital commitments amount to £104m. To meet these obligations and to restore a healthier degree of "liquidity" to the Corporation's financial structure—at a time when further losses appear likely—will bring B.O.A.C. very close to that £160m at present marking its maximum borrowing powers.

(*concluded at foot of page 213*)

CIVIL AVIATION . . .

On Tuesday of last week the first production de Havilland Comet 4, G-APDA, returned to Hatfield from its tropical trials in Africa. Sir Geoffrey and Lady de Havilland were among the passengers; they are seen here being met after disembarkation by Mr. A. F. Burke, D.H. Aircraft managing director (second from left), and by Mr. R. E. Bishop, design director (facing camera). The Comet 4 visited Khartoum, Wadi Halfa, Nairobi and Entebbe during its 2½-week absence.

VISCOUNTS IN THE UNION

SOUTH AFRICAN AIRWAYS' first Viscount is due to be delivered to South Africa later in the summer, according to a senior official of the airline, and all seven are expected to be operating near the end of the year, when revised traffic schedules will be introduced. S.A.A. do not expect major change-over problems to arise when the turbine-powered machines replace Skymasters on internal services. On the trunk route between Johannesburg and Capetown the DC-4s take from 3 hr 45 min to 4 hr and the L.749s from 3 hr to 3 hr 15 min, while the Viscount is expected to take just under 3 hr. S.A.A. have not yet announced seating arrangements for the Viscounts, but the aircraft is capable of carrying up to 72 passengers though normal first-class accommodation is for 52. The Skymaster carries 50 passengers to Johannesburg and the Constellation 58. Although it is not expected that on every flight between Cape Town and Johannesburg the Viscounts will be fully booked up, there is every expectation that the improvement in the volume of bookings so evident over the past few years will continue to be a feature of air travel in South Africa. The traffic to Port Elizabeth and other coastal towns from Cape Town has recently tended to rise, and results here are better than they were last year.

WHY AUSTRALIA BUYS AMERICAN

IT can be assumed that Mr. C. O. Turner, chief executive of Qantas, was not in England last week to purchase British aircraft. Indeed, the theme of the news conference arranged for him was the fact that Australian airlines, and Qantas in particular, have not bought, and do not seem likely to buy, Vanguards, Britannias, Comets or Dart Heralds.

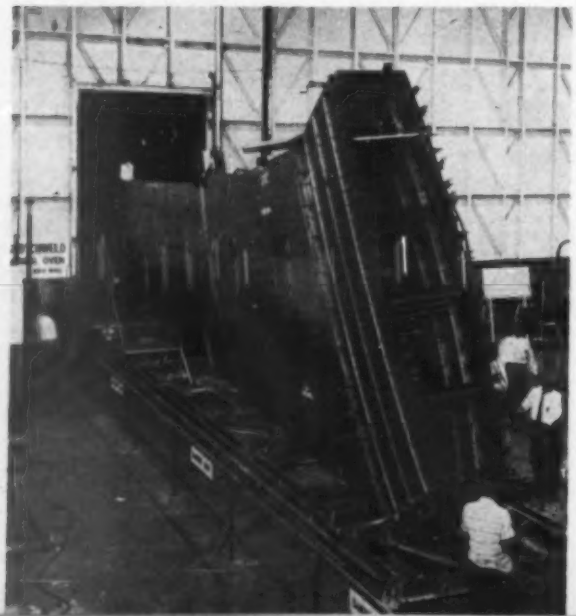
Mr. Turner had anticipated the raising of this subject, and before answering questions he suggested possible reasons for this state of affairs.

Qantas, he said, had bought Electras because the timing was right—14 to 21 months ahead of the Vanguard—and because the Allison prop-jet was backed by immense military experience. Furthermore, the same engine would power the R.A.A.F.'s 12 C-130s, and the new Qantas overhaul base at Mascot, Sydney, offered obvious engineering economies. It was logical that T.A.A., Ansett-A.N.A. and T.E.A.L. should have Electras also: for one airline to have Caravelles, another Vanguards, another Comets and another Electras would have made a "crazy pattern." His belief was that the British aircraft and aero-engine industry did not have the Government support it needed in order to compete successfully; and he dwelt forcibly on this argument.

"It is a matter of record," said Mr. Turner, "that Qantas had a number of major investigations into the Britannia. As it turned out the Britannia 312 which was considered suitable for our routes would have been available as a proved aircraft for operation on our routes in early 1959. Actually we will receive our first Boeing jet airliner in April 1959, and if I can repeat again, this illustrates how *timing* is so important. If we had, in fact, ordered Britannias, we would have had little competitive route operation out of them before there was the possibility of being out-matched by competitors with straight jet aircraft."

Mr. Turner was asked: were not Lockheed's trade-in-terms for Qantas Super Connies the heart of the matter? It had been a factor, certainly, but not the main one. Could he say what price Lockheed had offered? No, he could not; but the financing offered by British firms—both in terms of credit and trade-ins—had been "comparable" with the American offers. Was Mr. Turner in favour of a fare-differential between propellers and jets? Emphatically not: in his view the public should be offered the best air travel available, and he saw no point in penalizing jet transports (though he believed that Sir George Edwards of Vickers was in favour of a fare-differential).

Mr. Turner gave fair reasons why Australian airlines bought American. But he did not really give good reasons why they did not, with the notable exception of the Viscount, buy British.



PERSISTENCE IN THE ARGENTINE

BOEING'S sales efforts on behalf of the 707 and 720 in the Argentine have been strong. So active have the company's salesmen been, reports a local correspondent, that rumours of a cancellation of Aerolineas' Comet 4 order have been rife. These rumours reached such a pitch that the Secretary of Air made the following statement: "In view of the statements of Messrs. Jerome Kane and John I. Wagner [in the Buenos Aires paper, *La Prensa*] regarding an offer of Boeing aircraft to Aerolineas Argentinas this Secretariat wishes to state that the Secretary of Air has not, at any time, expressed any special interest in any type of aircraft other than [Comets]." The official statement went on to the effect that Aerolineas Argentinas were naturally always willing "to consider propositions for fleet renewal."

Despite the recent change of government, it appears that the Comet 4 order is secure because (1) Aerolineas is a preserve of the Secretariat of the Air, and this department, in conjunction with the Navy, is powerful enough to get what it wants; and (2) President Frondizi wishes to maintain a continuity of government policy towards trade. President Frondizi has repeatedly brought this "continuity" theme into his public statements, and has remarked that when a new government has promptly revoked agreements entered into by its predecessors this has been "harmful to Argentina's credit and international repute."

Aerolineas, who lost £2.5 millions last year, have banked a great deal on their Comet fleet, which they hope will place them on a sound financial footing.

"Done to a turn" is Convair's description of this 880 wing, seen emerging from an oven after the final stage of a Scotchweld bonding process. The wing is cured for one hour at 320 deg F. The first Convair 880 is due to fly in about five months' time; a new order is reported on p. 186.

À LA CARAVELLE

SOME weeks ago a London business weekly, discussing the very real threat to Britain's airliner markets of the Caravelle, described France's jet transport as "not as elegant as its name implies." Now good looks are not the sort of thing that serious students of airliner-form are supposed to talk about. You don't choose a wife because she wins a beauty contest; and airliners are bought because their operating cost characteristics are good, their break-even load factors are low, their timing is right. But looks do count; and my own opinion of the Caravelle is that she is a stunner. Anyway, this is a matter of opinion: and though I believe that my own reaction may be widely shared I do not think the point is of vital importance. Suffice it to say that Sud Aviation have created a jet airliner whose form has become classic-European.

Passenger-appeal, too, is generally a matter of widely varying opinion. I think the Comet 3, the Britannia 310 and the Viscount —particularly the 800—are quiet and smooth. But I have met people, few admittedly, who will argue about this. I do not think that there can ever be any dispute about the quietness and smoothness of the Caravelle. In these two respects it sets a standard which is absolute, and which I do not believe will ever be excelled.

On Tuesday of last week I was among those invited by Air France to fly in Caravelle F-BHHI during its two-day goodwill visit to London. Ours was the fourth demonstration of the day—a busy day for L.A.P. tower, judging by the fact that, owing to accumulated traffic delays, our flight was 1¼ hr behind schedule.

You enter the Caravelle from aft and underneath, as in the Martin 4-0-4; there are only nine steps, and the effect is of walking *into* the aeroplane rather than climbing up to it. A few paces along a narrow corridor, flanked by curtained wardrobes, past a smiling French stewardess of extreme elegance, and we are in the cabin—all light and colour, as anechoic as are all thickly carpeted and upholstered airliners. There are 56 seats four-abreast; the cabin is unobstructed by any structural intrusion; Air France's colour-scheme is formal but pleasing—informality being provided by jazzy curtains and Turneresque paintings on forward and after bulkheads. The stewardess welcomes us over a particularly high-fidelity public-address system, which then beguiles us with *Eine Kleine Nachtmusik*. I strain my ears to hear the engines start; I am sitting over the rear spar, and by craning my neck up to the window I can just see the starboard nacelle and tailplane. A slight shaking of the structure and a distant thin whistle indicates that our jets are turning, and then Mozart fades before the rumble of Rolls-Royce RA.29s as we taxi out for take-off.

The roll is smooth, even though I am directly over the main gear. Clearance for take-off down Runway 7 is immediate; Capt. Guy Rivière holds full power, Comet-fashion, against the brakes, and in less than 30 seconds we unstick sharply and then thrust steeply into the 15,000ft cloudbase. Mozart re-asserts himself, many hands reach up to adjust the individual cool-air louvres, and someone remarks loudly: "Toujours le bang-on!" I walk forward, and the lessening of noise—or rather increase in silence—is marked. Beyond the leading edge the quietness is almost glider-like; as one guest from the British aircraft industry remarked: "Quite extraordinarily good."

In the cockpit, which is occupied by four Air France officers, the quietness is even more pronounced; even aerodynamic noise seems curiously absent. Through wreaths of Gauloise I note the instruments: 260 kt I.A.S., 14,000ft, 6,500 r.p.m. (i.e., well-throttled back). The steward, though busy dispensing champagne from bottles cooling in the sink, is nonetheless pleased to explain the galley layout.

London Airport, July 30, 1958: Air France's Caravelle makes its official British debut, as described in the accompanying text.

Over the public address system a Sud Aviation representative presents a modest line of sales-talk. He tells us that this was the actual Caravelle in which General de Gaulle had flown to Algiers. He explains that the hole in the wing fence is a fuel-tank vent, and that the wires across it are to prevent further occurrences of a recent nest-building attempt by a Toulouse bird.

Warning that the air-brakes are about to be applied is given: we are asked to take our seats, a klaxon sounds, and up snap the big "signboard" brakes. The deceleration is strong, and the ensuing buffet quite noticeable for some seconds. Thereafter, with the Avons at constant power and flaps down, Capt. Rivière controls his speed and height with these brakes—right down to the threshold, where they make a final lift-destroying appearance.

We say our thanks and goodbyes, and envy Air France the jet airliner of which they—and all France—are so intensely proud.

J. M. R.

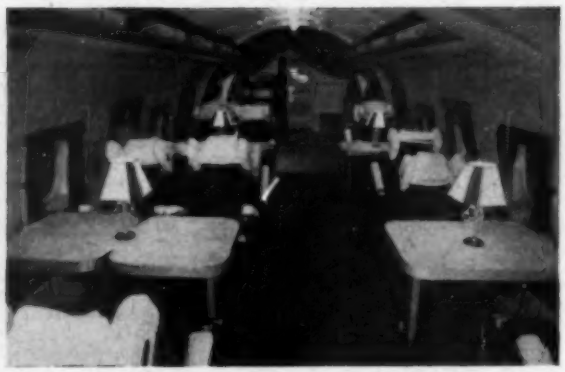
THE A.T.A.C.'s YEAR

MORE than any other single document, the annual report of the Air Transport Advisory Council provides an overall view of the progress achieved by Britain's air transport. In their officially appointed capacity as watchdog to the industry, the A.T.A.C. are able to report on the corporations and independent airlines in terms both balanced and comprehensive.

The Council's main task, as in previous years, is the consideration of route applications by British carriers. (The extent of their other function as a consumers' council is illustrated by the number of representations received from the public—three.) And, to quote the report, "the most noticeable feature of the period under review has been the very great increase in the number of applications received." These amounted to no fewer than 745, of which 703 were received during the year (670 from independents, 32 from the Corporations, and one from C.A.A.C.) and 42 were brought forward from the previous year. The Council made recommendations to the Minister on 641 applications, and, of these 640 had been decided (395 approvals, 245 rejections), at the year end.

The Council notes the increased traffic carried by each Corporation and by the independents and concludes that "the figures do not in the Council's view indicate that (the independents') operations have to any material extent adversely affected the expansion of the traffic of the two Airways Corporations." Looking at the independents' traffic on each class of service in turn, the report notes that internal scheduled traffic increased on routes to the Channel Islands (156,718 to 208,963 passengers) and to the Isle of Man (81,495 to 101,668), but fell on other routes (from 56,934 to 38,339). Vehicle ferry services improved slightly (44,349 to 48,814 cars), but these were still not up to the 1955-56 level (51,427 cars).

Inclusive tours accounted for a considerable increase (92,081 to 137,416 passengers) although "the change in economic conditions . . . probably accounted for the actual demand being rather less than had been expected." Nevertheless, "there were grounds for thinking that there had been some over-bidding for these services." B.E.A. opposed the majority of these applications on the grounds that "the capacity approved for the inclusive tour services of independent companies should be so regulated so that traffic on those services would increase only at a rate corresponding with that at which the Corporation's own traffic was expected to increase." The Council, however, has continued to base their decisions on the principle of "material diversion" and expresses the view that services should "continue to bring air travel more and more within the reach of the public." Colonial coach services showed only a small traffic increase (15,457 to 16,766 passengers), the main change being the replacement of Vikings by Viscounts on the Safari services, and the changed status of the Safari service to Accra (since Ghana became independent the colonial coach class service was changed to tourist class). As regards international scheduled services (on which the independent's traffic rose from 178,736 to 239,037 passengers), the major development came on services between provincial centres and the Continent.



Among charter flights recently carried out by British independent airlines were two in interesting contrast, one just across the Channel, the other right across the world. An Independent Air Travel DC-4 (left) carried the British delegation to the Council of Europe. Shortly before this a Britavia Hermes completed a six-week 22,000 mile charter around Africa on behalf of Shell, the aircraft interior (above, right) having been refurnished to provide executive accommodation for 16 passengers.

CIVIL AVIATION . . .

IRELAND LOOKS TO THE STATES . . .

AERLINTE'S transatlantic service appears to have made an encouraging start. All three L.1049 Hs chartered from Seaboard and Western are now in service and each evening of the week their service leaves Dublin at 10 o'clock, transits Shannon and arrives at New York the following morning at 7.25. The return flight leaves Idlewild at 2.30 in the afternoon and gets passengers back to Shannon or to Dublin by breakfast-time—the next day. By now over 2,000 passengers have been carried, and although it is early to say whether the break-even load factor will be achieved in the first year's operation, the airline management feels that the development costs for the first two years will be smaller than originally anticipated.

Almost two-thirds of the traffic is to and from Dublin and a high proportion of this travels onward to the U.K. and the Continent. Extensive connecting services to Scotland, Northern England, the Midlands, Wales and the West country, as well as to London, are offered by Aer Lingus, B.E.A. and B.K.S. Aer Lingus stands in a particularly strong position for acquiring this traffic for their sales programme is integrated with that of Aerlinte under the banner "Irish Air Lines." The presentation of timetables, in particular, shows the degree to which schedules are co-ordinated to allow as comprehensive a service as possible between the U.S. and Europe. American traffic is valued particularly highly, and from a tourist point of view it is felt that visitors lacking Irish connections and being introduced to Ireland for the first time will be more impressed by Dublin as a terminal point than by the mud flats of Shannon.

Aerlinte is now in a position to consider further route development, and it is likely that Boston will soon be shown on their network. The use of other North American stations is limited to a certain degree by the present need to base operations on New York.

Looking further ahead, Aerlinte has already been reported to be interested in a L.1049 H successor. There is the possibility of their ordering two long-range turbojets for delivery in 1960 or 1961. With the prospect of a differential-fare debate blowing up this autumn, those responsible for Aerlinte procurement have a big problem on their hands.

. . . AND TO EUROPE

MEANWHILE, Aer Lingus are disposing of their older equipment—their DC-3 fleet has now been reduced to ten—and are preparing for the impending arrival of their seven Fokker Friendships. Already quite a number of both air and ground personnel have been through the conversion course at Schiphol, and the number will increase once the summer season starts to wane. Three of their six Viscount 808s have already been delivered, a fourth is expected at Christmas, and the remaining two should arrive early in the New Year.

Aer Lingus traffic appears to be suffering less from the current recession than that of some other European airlines, an increase having been reported of 5 per cent over the 1957 level. Playing a large part in this increase is the "Centenary of the Apparition" service to Lourdes which by the end of the summer will probably have carried about 50,000 pilgrims. Freight traffic has also been expanding: only last month the manufacturers of Radiation Cadet gas cookers revealed their decision to ship all their Irish consignments on Aer Lingus' Manchester - Dublin service.

BREVITIES

THE Minister of Transport and Civil Aviation has appointed Mr. M. M. V. Custance to be a Deputy Secretary in the place of Mr. A. H. Wilson, C.B., C.B.E., who is retiring on July 31 and who is taking up a new appointment in the Ministry as Adviser on Commercial Air Transport.

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Panair do Brasil have sold their fleet of 13 DC-3s to N.A.B. (Navegacio Aerea Brasileira).

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A total of 50 Convair 340s and 440s have been modified for executive use by the Garrett Corporation AiResearch Aviation Services Division over the past few years.

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A report from Lisbon suggests that a new Portuguese airline, Artop, may take over Aquila's Lisbon-Madeira flying boat service when Aquila ceases operations at the end of September.

* * *

A DC-6 of T.E.A.L., carrying a V.I.P. party and letters with special covers and stamps, will cross the Tasman Sea on September 11 this year to commemorate the thirtieth anniversary of the first crossing by Sir Charles Kingsford-Smith.

* * *

A correspondent in Holland reports that the first of Aer Lingus' seven Friendships will be delivered to the Irish airline in October. The second production aircraft is due to go to Braathens, who have ordered three.

While C.A.A. await the use of Woodvale Airport, Bulawayo, they have leased one of their Viscounts to Kuwait Airways.

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Elder Dempster Lines have acquired a share in W.A.A.C. and not, as reported in last week's issue, in Ghana Airways.

* * *

Work on Shannon's new 10,000ft runway will begin next September, and will be completed within a year at a reported cost of £700,000.

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Kingsford-Smith Airport, Sydney, is to be extended at a cost of £A500,000. It has been recommended that a new international airport be built at Melbourne on a six square-mile site at Tullamarine.

* * *

Silver City announce the extension of their Roadair freight service to Lille. The operation from London will be thrice weekly. The British Independent also reports a 99 per cent increase in its air ferry traffic to France for the eight months ending May 31 last.

* * *

According to Mr. Oscar Bakke of the C.A.B., it is expected that the Boeing 707 will be granted a provisional airworthiness certificate "within the next two weeks" (Mr. Bakke was speaking on July 24). Present plans provided for full 707 certification by mid-August; and he anticipated commercial operations "within 60 days."

CLUB AND GLIDING NEWS

Competitors at Dunstable and Bratislava: Sgt. A. Gough, a member of the R.A.F. team in the National Gliding Week (reported on p. 187); and Sue Burges and Mike Reilly, members of the British team for the World Parachuting Championship, which is referred to on this page.

NOW taking place at Bratislava in Czechoslovakia and continuing until August 16, with some twenty countries participating, the Fourth World Parachuting Championship constitutes the largest—and the toughest—parachute competition ever held. The airfield has been given an extensive preparatory face-lift, which involved the demolition of old buildings and the erection of parachute-drying towers and a restaurant able to seat 1,500. The Czech team has been training at Bratislava since May, obviously eager to retain the title they won at Moscow, and the U.S.S.R. has given them two AN-2s—four more of these aircraft having been flown in from Russia to provide an almost non-stop airlift throughout the competition.

The British team of Sue Burges, Mike Reilly, Denis Lee and Sgt. James MacLoughlin (all of whom have paid their own expenses), though individually extremely capable, must inevitably suffer from the lack of subsidized training available to their competitors. John Fricker is the team pilot and "Dumbo" Willans the British F.A.I. representative at the meeting.

AS a result of experience gained during the World Gliding Championships in June at Leszno, Poland, the international jury which judged the standard class has now—at the request of OSTIV—rewritten the specification for this class. A draft of this specification has now been issued by OSTIV; and although it has not yet been adopted by the F.A.I. international gliding committee it is not thought likely that any major modifications will be made, so designers and constructors can work to it in building standard-class gliders for the 1960 championships.

Obligatory requirements are that the span must not exceed 15 metres (49ft 1¼in) and flaps and "other methods of changing the wing profile" are prohibited, as are ailerons whose neutral position can be changed in flight. No part of the undercarriage or its fairings may be retractable or extendable, and the aircraft must be fitted with a landing wheel of at least 70 mm (2¾in) in width and 250 mm (9¾in) in diameter—this latter requirement, however, not applying to individual aircraft built and flown before January 1, 1959. Ballast which can be discharged in flight is prohibited. The aircraft must have a C. of A. (recognized by the entrant country) which permits cloud flying when it is flown by a pilot weighing at least 90 kg (198½ lb), wearing a parachute weighing 9 kg (19.8 lb). Drag parachutes are prohibited, but the aircraft must be fitted with airbrakes capable of restricting the speed in a steady vertical dive "to a value not more than the maximum permitted with the brakes shut." The design and construction of the brakes must be such that they can be opened at any speed up to the maximum permissible with the brakes shut and closed at a speed of at least 75 per cent of this value. In both cases the operation of the brakes must be effected in less than two seconds. Entrants will be required to sign a form saying that certain diving tests have been carried out.

The jury also makes certain recommendations—that the glider should be cheap to make, using cheap materials and simple methods of construction; that it should be easily rigged and derigged, easily repaired and simple to transport on a trailer; that a wheel brake should be installed and the undercarriage be suitable for operation from rough fields; and that the cockpit should be of sufficient size to accommodate comfortably a man 1.90 m (6ft 3in) in height.

NEIGHBOURLY co-operation by Armstrong Whitworth Aircraft at Baginton has resulted in the Armstrong Siddeley Flying Club's Tipsy, which suffered damage to its starboard oleo during a forced landing competition, being made serviceable again with efficiency and speed. The club is especially grateful as otherwise they would have had to send the aircraft away either to Derby or Sywell.

THREE successful flights were made by the two-seater Harbinger sailplane at Hucknall, Notts, on July 26—representing the culmination of nine years' work on it by F. S. Coleman of the Derbyshire and Lancashire Gliding Club. Modifications to the original design by Shenstone and Czerwinski include a considerable lengthening of the nose to bring the seats further forward and an increase in space between the two seats (which are in tandem) by 15in. Mr. Coleman was one of the founders of the Manchester Gliding Club in 1930, becoming its first secretary; with club members, he helped to build its first glider (an open primary) at a cost of £30. Prior to the war he constructed a Grunau Baby, *Black Diamond*, which was still to be seen flying at the Camphill site in post-war years.

B.O.A.C. 1957-58 (continued from page 209)

Discussion: The following is a summary of points raised during the discussion of B.O.A.C.'s annual report at last week's news conference.

Asked to enlarge on the suggestion that B.O.A.C. should be given financial assistance in their development work on new British aircraft, Sir Gerard said that such assistance—which had been discussed with the Minister—might take the form of a development flying contract. To a question whether industry or taxpayer should find the money Sir George Cribbett replied that B.O.A.C. sought a contract with the M.o.S.; whether the liability was with the industry or the taxpayer was not for the Corporation to decide. Pressed to disclose the cost of Britannia development, Sir Gerard said "several millions." The Comet 2E programme had been to a Government contract, which had "partly covered costs."

Asked whether the Britannia was up to expectations of its economy, Mr. Basil Smallpeice said that "by and large" it had been. Break-even load factor on the North Atlantic had been about 60 per cent; load factors of 80 to 90 per cent on this route had been achieved.

When would DC-7Cs be disposed of? Not until Boeing 707s began to be delivered in December 1959. Were B.O.A.C. going to buy any of the five ex-Northeast 305s? A lease arrangement for four was being negotiated with Bristol; these discussions might result in the disposal of some 7Cs.

Sir Gerard replied to questions about the Comet 4 by saying that it was hoped to open a North Atlantic service "in the autumn." [Previously B.O.A.C. have said "before the end of the year"—presumably a date in October or November is now the aim. PanAm's official date for 707 services is likewise "in the autumn."]

On the score of jet noise Mr. Smallpeice said the Comet 4 was quieter than the 2B, which had created no problems. The Boeing 707 would, thought Sir Gerard, be coming to London for tests in September.

Asked about the disposal of piston fleets, Mr. Smallpeice said that B.O.A.C. were seeking dollar buyers for the Constellation 749s, which had been bought for dollars. They were "in contact" with agents and airlines, but there was unwillingness to buy. Sir Gerard confirmed that 14 out of 16 Stratocruisers were to be returned in part exchange for 707s.

Sir Gerard forecast the disappearance of tourist fares in the face of a "quite startling" increase in economy traffic; the latter would probably be extended to African and Eastern routes as a result of the I.A.T.A. traffic conference in September. B.O.A.C. had been "top of the list" in economy-class business.

Pressed to explain what was meant by "the present time is not opportune for . . . the more speculative forms of exploratory development," Sir Gerard referred to Polar and South American routes, which B.O.A.C. were unlikely to operate yet.

Were B.O.A.C. opposed to a fare-differential between jet and propeller aircraft? Sir Gerard said: "We have large jet fleets on order, and we don't want to jeopardize our chances of filling them. We are not in favour of a differential, generally speaking." It might, he said, be appropriate in some fields, but not on the long hauls. He had no objection to B.E.A. having a fare differential.

Asked about the efficiency drive in B.O.A.C.'s engineering departments, Mr. Smallpeice spoke of a "fall" in staff numbers, but said there had been no question of dismissals. He did not want to be pressed to say whether dismissals were in fact likely, as this might prejudice negotiations.

Would B.O.A.C. make a profit or a loss in the current financial year? Sir Gerard thought that B.O.A.C. would be "lucky" to make a profit. For what increase in business had B.O.A.C. planned during the current year, and for what load factor? Mr. Smallpeice said that a planned increase of 22 per cent capacity had been planned; a lower load factor was expected [the 1957-58 load factor was 60.5 per cent]. Was not the capacity increase of 22 per cent optimistic in view of last year's experience? Mr. Smallpeice explained that B.O.A.C. had "much leeway to pick up"; the setback last year was mainly on the North Atlantic, where the position was now improving.

Other items of interest learned during the discussion were: (1) the Rotodyne was considered too big for service in the Caribbean; (2) B.O.A.C. were discussing with B.E.A. arrangements to service that Corporation's Comet 4Bs; (3) B.O.A.C. did not consider that it was their job to invest money in such projects as the rail link to London, or in hotels, because these were not their business; (4) M.E.A., a B.O.A.C. associate, made a net profit of £44,000 during the year; (5) Comets would be introduced on to the South American route in 1960, when they had been freed from the North Atlantic by 707s.

THE INDUSTRY

Ingenuity in Galley Furniture

THE design and manufacture of airliner galley furniture poses a number of problems. Like an airframe structure, it must combine lightness, compactness and strength; and at the same time it must have the qualities of any good catering equipment, i.e., its labour-saving, hygienic and other characteristics must add up to a high level of operational efficiency.

To judge from visual inspection, and from the fact that B.E.A. and a number of other British and foreign airlines have placed repeat orders, the galley equipment made by W. Henshall and Sons (Addlestone), Ltd., of Oyster Lane, Byfleet, Surrey, effectively meets these difficult conditions. The firm have been in the sheet-metal business since 1897, and have been making aircraft sheet-metal and other aircraft components since the early days of aviation, so they have a good store of experience available for the various production problems of galley furniture.

The principal unit of the Henshall series is a "container stowage," or what might be described in more domestic terms as a chest-of-drawers. Constructed from light-alloy angle and channel section, panelled in Birmabright with a stainless-steel table-top and beading, it fits the aircraft seat-rails (which, of course, extend under the cabin bulkhead) and is attached to them by locking plungers.

This type of stowage is in service on some Viscounts, accommodation consisting of two food containers, two bar-boxes and two dry-ice refrigerators, or any combination of the three. For these receptacles a Henshall patented system of construction is used, giving them ample strength to withstand the treatment they are likely to receive when being ground-handled away from the aircraft.

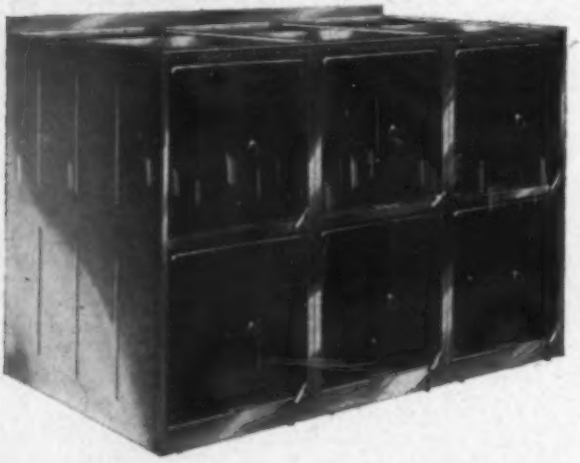
Anodized Duralumin panels of 22 and 24 s.w.g. are corrugated into deep right-angle channel sections, and each panel has another placed against it face-to-face, but with its channels running transversely. The two panels are then united by Pop-riveting at each intersection of the channels, the result being an extremely rigid yet light cellular-construction slab. Five of these slabs go to build up the box, being united by a series of 16 s.w.g. deep-drawn angle brackets, one to each corrugation. The angle brackets are in turn covered, and the structure further braced, by lengths of right-angle protective edging strip. Various designs of double-opening door can be fitted in accordance with customers' requirements. All joints are sealed, so the container can be steam-sterilized.

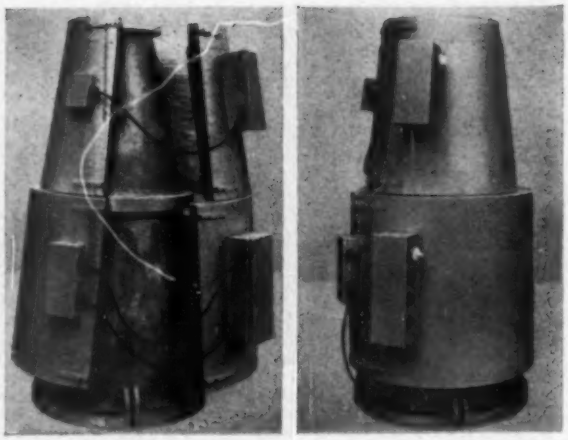
The basic-sized container (16in high×16in wide×21in deep and weighing 13 lb) takes 12 plastic food-trays, and there is a larger size that accommodates 16.

Of similar cellular construction, the other items which go to make up a complete stowage unit—though any can be supplied independently of it—are the refrigerator and the bar-box. Designed in collaboration with B.E.A., the former is a 1.75 cu ft thermally insulated container in which air is circulated over a dry-ice pack by means of a fan. Studs at the rear provide an automatic connection for the 24V supply to the fan motor when the container is slid into the main stowage unit. It is stated that one filling of dry ice provides 23 hours' cooling, the rate of which can be preset by a thermostat.

The bar-box (16in×16in×21in) is fitted with three drawers to hold the miniature bottles normally used in airline catering, and is provided with a locking bar in accordance with Customs regulations. Like the refrigerator, the box has retractable carrying handles.

Henshalls emphasize that all this equipment can be made available in various modified forms to individual requirements, particularly in the matter of dimensions and in such details as plastic door-facings, chromium handles and other fittings.





An "Isomantle," used by Bristol Aircraft for the curing process during the production of glass-fibre/resin radomes. These heating mantles, from the range of electric surface-heaters manufactured by Isopad, Ltd., Boreham Wood, Herts, are made in hinged halves to facilitate application over the mould. Automatic controls allow individual regulation of each of seven horizontal heating-circuits.

IN BRIEF

Mr. P. T. Ensor, formerly general manager of the Canadian British Aluminium Co., Ltd., has now returned to the United Kingdom and has been appointed assistant to Mr. G. W. Lacey, commercial director of the British Aluminium Co., Ltd.

* * *

Technical information sheets and illustrated brochures describing the properties of Superston alloys have been published by J. Stone and Co. (Charlton), Ltd., Woolwich Road, Charlton, London, S.E.7. A special point is made of the fact that—unlike many other materials of equivalent strength—these alloys are weldable.

Mr. Sidney Allen, M.I.Mech.E., F.R.Ae.S., who—as reported last week—has been appointed Armstrong Siddeley's chief engineer for all products except cars.

* * *

The Hellermann hand compression tool kit (Air Ministry ref. no. 5X/7300) has now been adopted as the standard cable servicing kit for the R.A.F.

* * *

Additional premises at 4 Tilney Street, Park Lane, London W.1, have been acquired by B. and K. Laboratories, Ltd., and will be opened during September as a permanent exhibition of electronic instrumentation. Cinema and extensive international library facilities will also be provided; and sales enquiries will be handled there instead of at the existing office in Union Street, London S.E.1.

* * *

At an informal reception in London recently, Racal Engineering, Ltd., entertained delegates to the Commonwealth Conference of the British Joint Communications and Electronics Board. Several Racal radios were exhibited, including the RA.17 communications receiver, over 1,000 of which have been sold, and the TRA.55 radio telephone. The L.F. converter and a single sideband adapter for the RA.17 were also shown.

On the left is a Henshall container-stowage unit, and on the right is a typical container, in this case for food trays (see "Ingenuity in Galley Furniture," above).

CORRESPONDENCE

The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns. The names and addresses of the writers, not for publication in detail, must in all cases accompany letters.

Airspace, Civil and Military

YOUR editorial of June 6, "Collision," seems to reflect the hysteria which is prevalent in many circles over here and to be similarly based on ignorance of the facts. I will try to take the points in the order in which you gave them.

I quote: ". . . two airliners have been struck out of the sky by military jets"—the implication is that the military aircraft are to blame for these accidents. Apart from the fact that it takes *two* unseeing crews eventually to collide I would point out that all the aircraft concerned were flying perfectly legitimately within the airspace.

"The only solution . . . is joint control." Do you really believe that at present there are two independent systems, military and civilian, in the U.S.? If so you have been badly misinformed. V.F.R. flying off airways is relatively unrestricted in the area near training bases. I.F.R. flying is strictly controlled by C.A.A. (C for *civil*) agencies. For any local I.F.R. training our operation is completely co-ordinated with Atlanta A.T.C.C. which decides on climb and descent procedures and allocates an altitude to each individual aircraft. How much more civilian control do you want? Unless, of course, you would like the intercepters to file a flight plan and wait for a clearance to get up to meet an oncoming "Bison?" (Note: I said "civilian" control; C.A.A. has gone beyond the "joint" stage for all except tactical operations.)

It is interesting to note that the U.S.A.F. definitions of I.M.C. are very much more restrictive than C.A.A. require. For example, in-flight visibility must be five miles for U.S.A.F. V.M.C. but only three miles is required by C.A.A. Cloud clearance: 1,000ft vertically and one mile horizontally for U.S.A.F.; 1,000ft above and 500ft below vertically and 2,000ft horizontally for C.A.A.

Allow me to note just two of the things the U.S.A.F. did to reduce the V.F.R. collision hazard before any of the recent collisions occurred (remember the civilians have control of I.F.R.). First, they have tried without success to obtain specific areas for V.F.R. practice in aerobatics and similar odd manœuvres for training aircraft. Secondly, about six months ago all the training aircraft of Air Training Command had their tip tanks, or tips and tails painted with fluorescent orange paint. This is now being extended to all of the smaller aircraft in the U.S.A.F. Transport aircraft of the U.S.A.F. have had high-intensity collision-warning lights for a similar length of time.

I feel that the allocation of specific military *training* areas is the crux of the problem. I have been told by an Air Force associate, who was there at the time, that in 1954 a conference was called by the U.S.A.F. at Las Vegas and all the civil airlines landing in or passing through the area were invited to send representatives. The Air Force tried to get the airlines to agree to set up a corridor and approach lanes. In effect, they gave the airlines a blank map and said, "You draw the corridor exactly where you want it, anywhere, and we will keep out of it." The airlines would not agree. In 1958 there was a collision at Las Vegas: 47 people were killed in a DC-7 and two in an F-100F.

Our local area has eighteen separately numbered airways passing through it at present and two more are to be added shortly; this does not include the high-level airways in the continental control area above 24,000ft. It takes less than ten minutes to reach the furthest point of the area from base at a normal cruising speed of 300 kt T.A.S. We have an average of fifty T-33s airborne within the area at any one time and they must stay off the airways. They *do* try to stay off the airways, but it becomes rather frustrating when an airliner floats through off airways V.F.R. just to save a few pints of fuel by cutting corners.

At the height of the hysteria we were restricted to flying *not above* 2,000ft (two thousand feet—I did not leave out a zero). We have stabilized now on a relatively permanent basis and have been left with about half our old local area in plan, about two-thirds of it in altitude, exactly one-third of the instrument training facilities, and the same number of airways.

The 100 per cent control which you say must come in future is a very long way off. C.A.A. has very recently said that it can only positively control 15 per cent of the total civil and military air movements. I have frequently sat in a T-33 waiting for an I.F.R. clearance for over two hours; being strapped in with helmet on (to listen for the clearance) in a shade temperature of 95 deg F is in itself conducive to accidents caused by fatigue and heat exhaustion. On two occasions in the last two months I have been requested to hold, in a holding pattern, for thirty minutes beyond the fuel endurance limit specified in my clearance. On each occasion the base was just a normal run-of-the-mill facility with no special problems.

I feel that there are three basic reasons for the present mess. Firstly, the Americans have had much more airline traffic for much longer than the U.K., and as a result the whole A.T.C. system, geared to relatively low-speed low-level operation, is so enormous that any change to keep up with aircraft performance is a major undertaking.

Second, there always was so much airspace that it was given away in airways too freely (e.g., the 18 airways surrounding this base, half of which have only two scheduled runs each day and tie up an airspace ten miles wide from 700 to 24,000ft.

Finally, too many of the controllers still think in terms of the whistle-stop DC-3 and are quite happy to try to hold jets for long periods at low altitudes.

Please do not let us adopt the American air traffic control system or its future derivatives. It was fine ten years ago when it was coping with the traffic for which it was designed. Turbine aircraft have made the system completely out of date and the modifications are going to have to be based on the present facilities, which are too extensive to scrap. Let us build a system suited to our needs. They are not the same as America's needs, simply due to the geography of the country and the distribution of the population.

My final plea. Aerobatics etc., are most difficult to pin down to an exact airspace and altitude. Why not designate restricted military training areas which do not contain airways? Operational flying must, of course, retain freedom of action for obvious reasons as pointed out in your editorial. But we don't build four-lane highways across the artillery ranges on Salisbury Plain, so why mix airliners and jet aerobatics in the same area?

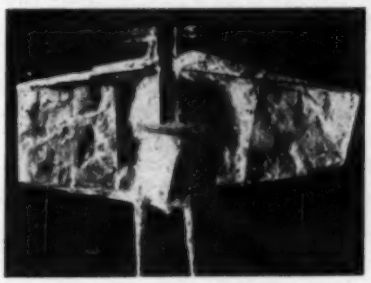
Craig A.F.B., Alabama.

W. E. KELLY,
F/Lt., R.A.F.
Operations Officer.

P.S. The new transcontinental airways are ten miles wide, not forty.

That R.34 Memorial

ROGER BACON usually strikes the note most appropriate to the subject of each of his trenchant paragraphs, but I cannot share his lighthearted view ("Straight and Level," July 11) of the artefact that the Air League is threatening to erect at London Airport. If the thing had merely been a part of the decor I, too, might have been resignedly amused. As it is to be a monument to a historic British achievement in aviation, however, the matter becomes deadly serious, the Air League's proposal little short of outrageous, and I can see nothing funny in it at all.



". . . the artefact that the Air League is threatening to erect at London Airport."

It seems that the sole function of so many of the objects that we are—indeed, we have to be—told are works of art is to be controversial. Certainly any attempt to dismiss them as the pretentious nonsense which they are provokes howls of protest from the apologists and intellectual snobs without whose support modern so-called art (in all its forms) would not survive for five minutes. It is not my purpose in this letter to provoke controversy of this nature. If present-day exponents of the various arts wish to produce and go on producing evidence of the intellectual bankruptcy which is one of the stigmas of our time, and if there are others who, in synthetic ecstasies, pretend to "understand" and "see meanings" in these products, that is their business entirely and we need waste neither time nor sympathy on them.

What I now sincerely and anxiously question is the justification for the exhibition of this grotesque thing at one of the principal gateways to the United Kingdom, and the propriety of designating it as a monument to a great achievement by British men of the air. It stands instantly condemned by the fact that the Air League has felt obliged to publish an accompanying apologia which is as pathetic a bit of sophistry as has ever seen the light of day. After all the turgid and slightly nauseating twaddle about defiant and indomitable conceptions, symbols and vitality, one is left with the

CORRESPONDENCE . . .

stark fact that this scrawny, lumpy, lopsided object will, unless the Air League is brought to its senses, stand as the nation's chief memorial to a great and graceful airship and to her gallant crew. Those visitors to our shores who do not view it with incredulity will unhesitatingly laugh it to scorn; certainly they will never guess what it commemorates.

Were thirty-two men ever before so publicly and so enduringly insulted as R.34's crew have been by this decision of the Air League? Although one can only applaud the League's idea of erecting a memorial to this great flight, one is compelled to remind that body that such an undertaking carries with it the responsibility of providing a dignified and worthy monument. In this respect the League has failed abysmally, and British aviation must do all it can to prevent the installation of this thing at London Airport. Who will start a petition?

Some years ago a very sensible young man was so outraged by a creation in wire, described as a sculpture and named *The Political Prisoner*, that he squashed it flat in a splendid gesture of spontaneous protest. Does anyone know his present whereabouts? Unless the Air League can be saved from itself, there will be a really worthwhile job for him to do at London Airport. That is, unless the survivors of the R.34 crew beat him to it.

Birmingham. J. M. BRUCE.

The Great Cody Controversy

IN Mr. Gibbs-Smith's article "What is a Powered Flight?" (July 18), I was astounded to read in the final paragraph: "It was not until November 1907 that the flight time of 59 seconds was equalled by a European, and *not until the winter of 1909 that it was equalled in England* (my italics). I must emphatically contradict this statement, and point out that Cody exceeded this many times in the spring of that year and in August was carrying passengers for flights of eight to ten minutes. In the autumn (September 8, 1909) he made a cross-country flight of over an hour, during which he unofficially exceeded the world's height record.

The pioneers of flight were much too busy pioneering to keep careful records or diaries of daily happenings, and therefore a true historian has to find his main source of material in the memories of living people who were eyewitnesses of their early flights. This Mr. Gibbs-Smith refuses to do, preferring to search among musty documents for letters which were never written, and for press cuttings that were never printed.

Instead of accepting the evidence of actual witnesses who are still alive, he states that they "deviate," suffer from "mis-memory," are "wishful thinkers," and have "lapses of integrity."

In his July 18 article he states that "to qualify for having made a powered and sustained flight an aeroplane should have sustained itself in a horizontal or upward flight-path—without loss of airspeed—beyond a point where it could be influenced by any momentum built up before it left the ground."

Here arises a vastly important question: Were Cody's (and Roe's) flights terminated at the will of the pilot—or did gravity bring the machine back to earth at the end of its "ballistic trajectory"? (Remember, Cody's machine weighed one ton.)

All Cody's flights of May 16, 1908, qualify under Mr. Gibbs-Smith's definition quoted above, and now Professor Richards has proved that A. V. Roe's flight on June 8 of that year also qualifies as a flight, and not a hop or powered leap. Both terminated their flights, to prevent their machines running into obstacles, of their own free will. In each case they (a) were not catapulted; (b) did not take off downhill (at Brooklands the banking was too steep, and there was a barrier across the track at the end of the finishing straight); (c) did not jump or leap into the air from the sudden application of the elevator; and (d) did not leap into the air through meeting an obstruction, or because the ground was uneven.

Mr. Gibbs-Smith quotes Wilbur Wright's opinion that a machine might "jump" about 250ft, but does not say that the Wright machine was always catapulted into the air between 1904 and 1910. He also omits to point out that in the *Century Magazine* for September 1908 the brothers claimed that Orville's flight of 120ft (this was the most they ever claimed), was the first *flight* in the history of the world.

Mr. Gibbs-Smith states that he "suggested—and the Director of the Royal Aircraft Establishment agreed—that a minimum distance of *about* a quarter of a mile (1,320ft) should stand as a modest criterion of a simple powered and sustained flight . . ." Fortunately I was able to quote his previous dictum (in the *Journal of the Royal Aeronautical Society* for September 1954) that Cody's flight of 150ft was a proper powered, sustained and controlled flight. This leaves the Director of the R.A.E. completely "in the air," and alone in his definition that nothing under a quarter of a mile counts as a flight; and therefore I respectfully submit that he can no longer justify the alteration to the plaque on Cody's tree, and that the original inscription should be speedily restored.

To say that the date of Cody's first flight was not put forward until many years afterwards is not true. Cody gave lectures entitled *From Kites to Aeroplanes*, using lantern slides, and he always gave the date May 16, 1908. I use those same slides myself today, and in the lid of one of the boxes, in Cody's own handwriting, is a list of the slides. One caption says: "First flight 16/5/08."

Finally, may I say that a refusal to accept the word of eyewitnesses of an event is contrary to the principles of British justice, and the insistence that a flight should be measured by the theoretical distance flown "through the air" most certainly cannot be considered seriously, as it is a most one-sided argument, produced in an attempt to prove that 150ft is not far enough to be called a flight in 1958, although it has previously been recognized, as such, for over half a century.

Virginia Water, Surrey. G. A. BROOMFIELD.

ARGUMENTS about the first aeroplane flights in Britain now produce yawns and a prodigious rolling of eyes towards heaven. A pity. Yet even if no further quotes are produced about what allegedly happened in 1908, it might be well to recall what certainly did happen in 1958.

In the first of his two April pamphlets, Mr. Charles H. Gibbs-Smith dealt with the change of dates, on the Farnborough plaque recording Cody's first flight, from May 16 to October 16, 1908.

The change might have passed generally unnoticed, he wrote, "had not the surviving relatives and friends of Cody, and especially his friend and biographer, Mr. G. A. Broomfield, felt strongly that the originally accepted date was correct and May 16 should still be accepted . . . Their concern is perhaps not unconnected with certain claims made for the great pioneer, the late Sir Alliott Verdon Roe (A. V. Roe), which are centred on June of 1908."

There is an implication here—unmeant, I trust—that this "concern" was not wholly for the truth, but to "get in fust."

In the many years I have known him, Mr. Broomfield has always been solid on the May date. Cody is a religion with him. Mr. Broomfield may be wrong or right, but I am confident that he would not tinker with the truth, as he saw it, even to prevent a modicum of glory passing from his hero.

Mr. George Fyfe wrote an article on Cody in the *Daily Telegraph*, whereupon Mr. Gibbs-Smith wrote to the editor of that newspaper regretting that Mr. Fyfe "did not check some of his facts." This seemed a hurtful, slighting reference to an experienced and honourable journalist, all the more odd when one of the alleged errors, the May date, could have been lifted from Mr. Gibbs-Smith's own history.

In April, Mr. Gibbs-Smith classed Mr. Broomfield among "highly reliable" Cody witnesses. In May, alas, he found that Mr. Broomfield's book on Cody had so many errors that Mr. Gibbs-Smith would have "deemed it churlish to single out more than were necessary."

Later, Mr. Gibbs-Smith claims the right to be "a little bored" with Mr. Broomfield. And now ("What is a Powered Flight?" in *Flight* for July 18) he tells us that among items to be taken into account in considering claims for powered flight are "lapses of integrity." Who is under the lash here?

The suggested minimum-distance figure, of about 1,320ft, to make a claim acceptable, gets us nowhere. If I am bumped off the ground at 25 m.p.h. in a tiny 10 h.p. job, and keep up for 1,200ft, I have not flown. But if in a 1,000 h.p. monster, I am bumped off at 100 m.p.h., and cover 10 per cent more, I *have* flown!

Cody's title of "Colonel" was knowingly used by millions. It seems mean and grudging to drop it from the plaque. Perhaps somebody now will seek to remove the military title from memorials to General Booth, founder of the Salvation Army.

London, E.C.4. ALAN TOMKINS.

Dorman Hit for Six

YOUR correspondent B. J. Hurren asks who was the first man or boy to ascend in Cody's kites. Surely it must have been Cody himself. In 1901 or 1902, when I was seven or eight, I used to watch Cody flying his kites from the Crystal Palace football ground, and I often saw him ascend in the basket, towed up the cable—held by a team of four or more kites—by a pilot kite.

On my way to or from my prep school I used to pester him for a "kite-ride," for he was very kind to small boys. Then one morning he said I could have "just a little lift." I clambered into the basket—and I was airborne for the first time in my life. I don't think I went very high, probably not further than he could hold the basket with his long arm. But I shot a terrific line to the chaps at school.

The flight made me late for school and when I gave as my excuse that I'd been up in Cody's kite I was told to bend over the table and got six of the best for "being such a silly, reckless little boy." The master told me pompously he hoped that the caning would teach me a lesson. It didn't! But I *did* learn the dangers of careless talk.

I'm not claiming to be the first other than Cody himself to go up in his kites. It has never occurred to me that perhaps I was.

London, S.W.5. GEOFFREY DORMAN

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	2nd place	Mr. Biancotto, France
1958	1st place	Mr. Biancotto, France *Airplane — Z 226 TRAINER*
	2nd place	Mr. Beseda, Czechoslovakia *Airplane — Z 226 TRAINER*

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THIS application will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on 30th July, 1952. Any representations or objections with regard to this application must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3 Dean's Yard, London, S.W.1, from whom further details of the application may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. [8155

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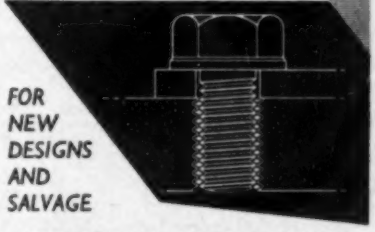

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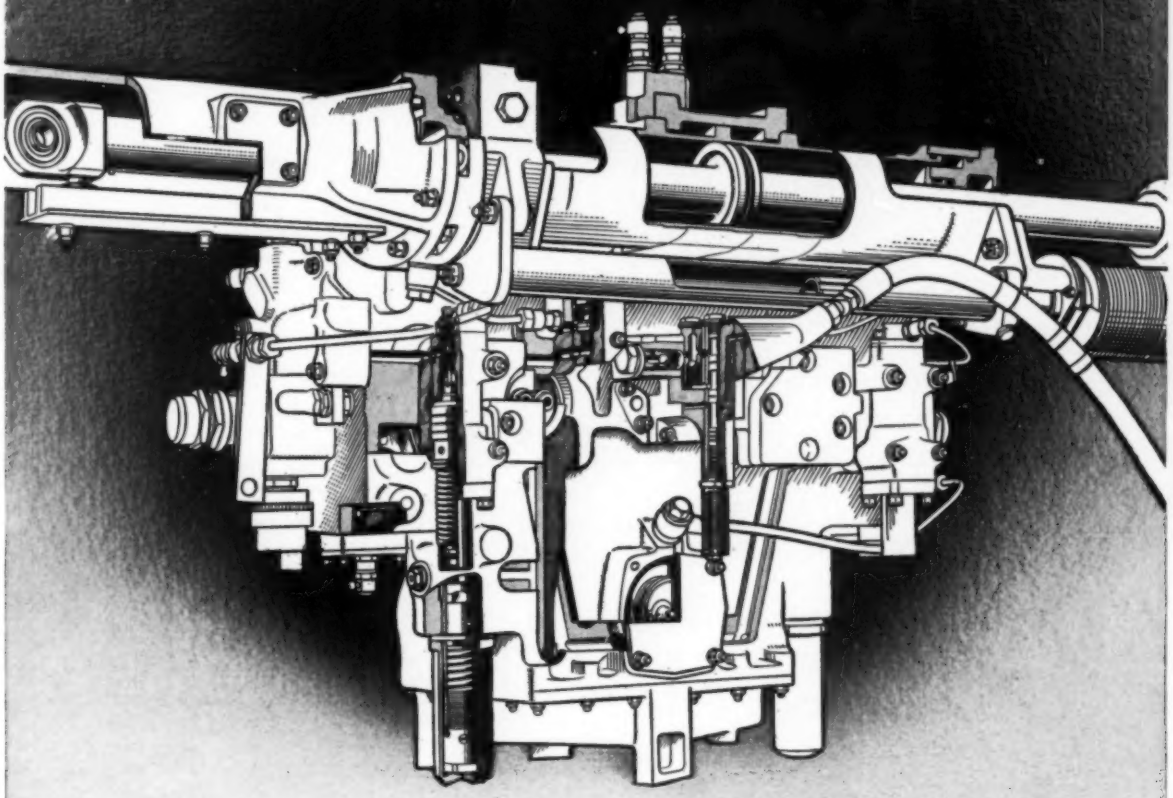

Increasing numbers of modern aircraft incorporate Boulton Paul powered flying controls in their design. Why is this? Because Boulton Paul Power Controls are sensitive, accurate, stable, reliable and safe.

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WOLVERHAMPTON, ENGLAND

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PROTEUS

Reliability and ease of maintenance praised by Aeronaves

Through their chief engineer, Sr I J Vargas, Aeronaves de Mexico give high praise to the Bristol Proteus 755, the jet-prop which powers their Britannias.

Proteus reliability cuts delays

Reporting on the first three and a half months of Britannia operation, Sr Vargas said that Aeronaves had not had a single delayed schedule due to engine trouble. "This," says Sr Vargas, "has set *a new standard of mechanical reliability* for engines in our airline and has inspired our aircrew with great confidence."

Proteus requires minimum maintenance

"Our maintenance personnel too," continues Sr Vargas, "are well satisfied, since the minimum of daily maintenance is required by these engines."

"Because of this, we in Aeronaves consider the Bristol Proteus to be the nearest approach to the *ideal propulsion unit for transport aircraft*."

The Proteus is extremely suitable for air transport, because its mechanical excellence and exceptional reliability ensure long, trouble-free life. It is the most powerful jet-prop in airline operation and has the lowest specific fuel consumption of any gas turbine in service.

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